DOCUMENT RESUME

ED 115 261 95 IR 002 805

TITLE Satellite Technology Demonstration; Final Report.
INSTITUTION Federation of Rocky Mountain States, Inc., Denver, Colo.
SPONS AGENCY National Inst. of Education (DHEW), Washington, D.C.
PUB DATE 15 Oct 75
NOTE 310p.; For related documents, see IR 002 769-793 and 002 804

EDRS PRICE MF-$0.76 HC-$15.86 Plus Postage
DESCRIPTORS Audiences; Career Education; Citizen Participation; *Communication Satellites; Community Role; Delivery Systems; *Demonstration Projects; Educational Radio; *Educational Television; Experimental Programs; Inservice Programs; Program Evaluation; Programing (Broadcast); Regional Programs; *Rural Education; *Telecommunication
IDENTIFIERS Appalachian Educational Satellite Project; Federation of Rocky Mountain States; Health Education Telecommunications Experiment; *Satellite Technology Demonstration

ABSTRACT

The goal of the Satellite Technology Demonstration project (STD) was to show the feasibility of a satellite-based media system for isolated, rural populations and to test and evaluate user acceptance and the cost of various delivery modes using a variety of materials. The STD amalgamated the resources of government, health, education, and broadcasting organizations and produced such programs as: "Time Out"--a career education course for junior high school students--"Careers and the Classroom: A New Perspective for Teacher"--an inservice program for teachers in the curriculum of career education, and "Footprints"--a series of community-oriented evening programs. The technical performance of the satellite and the network of inexpensive ground terminals which serve 23 states has exceeded design requirements. In this report, objectives, planning and development, and results are extensively discussed, and a project evaluation considers hardware performance, program acceptance, student learning gains, and costs. (EMH)

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FINAL REPORT

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SATELLITE TECHNOLOGY DEMONSTRATION

FEDERATION OF ROCKY MOUNTAIN STATES, INC.
2480 WEST 26TH AVENUE, DENVER, COLORADO 80211

As we plan the year long hiatus of the STD and reflect upon what we have done, it is evident that we accomplished much more than we anticipated. We demonstrated technically and pragmatically the feasibility of using communicaions satellites in the delivery of social services. Retrospectively, these accomplishments do not surprise us: both areas had met with success in previous individual experiments.

What we are proudest of is our user-responsive design — a concept unique to the STD which deliberately and systematically involved people in the planning and operation of the Project. No other project of such magnitude has incorporated this dimension so integrally into its planning, development, and operation.

User involvement did not come easily, nor was it inexpensive. Acceptance of the concept of a user-based system was made difficult by conflicting interests, both external and internal. A user-responsive system, although foreign to many, was one which we were committed to pursue. When budget cuts were mandated, field services were always identified as "the expendable." We did not permit this reduction.

Measures are relative. Those which can be quantified with some degree of confidence apply to production and engineering tasks. But when the diversities of people are involved, there are few scales to measure different attitudes, interests, abilities, aspirations, and motivations. We recognized and accepted these differences and the difficulties associated with human diversity — a worthwhile effort which proved to be the key to the success of the STD.

By design, the STD was user-based. We can say with pride and confidence that we involved people. More importantly, the people felt involved — the ultimate accomplishment of a user-responsive system.

Gordon Law

Dr. Gordon Law
Project Director
October 15, 1975

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ABSTRACT

The Satellite Technology Demonstration (STD) marked the beginning of a new era in the delivery of social services. For the first time in history, communications served widespread health and educational needs in remote, isolated communities. This unique project developed educational programs, materials, and services and delivered them directly by satellite to specific audiences at a modest cost. The STD amalgamated the resources of governmental, educational, health, and broadcasting organizations and provided them the opportunity to use and evaluate a variety of communications applications in the Rocky Mountain states.

Negotiations with the federal funding agencies resulted in the following Project objectives: to demonstrate the feasibility of a satellite-based media distribution system for isolated, rural populations and to test and evaluate user acceptance and the cost of various delivery modes using a variety of materials. These objectives were accomplished.

Four television programs were developed and broadcast. The STD's principal courseware product was "Time Out," a career education course serving 22,512 junior high school students in the 8-state region. "Careers and the Classroom: A New Perspective for Teachers," an in-service program for teachers, was broadcast to complement the career curriculum; 876 teachers received college or recertification credit. "Footprints" was a series of 10 community-oriented evening programs. The Materials Distribution Service was a delivery-system alternative to conventional mail-transported film and videotape distribution; using 155 hours of satellite broadcast time, this service provided current high-quality filmic materials to remote, isolated communities; 190,000 viewings were documented.

The Applications Technology Satellite (ATS-6) and the entire receiver-transmitter ground network operated almost flawlessly; signal quality and performance far exceeded design requirements. The STD served 69 terminals in the Rocky Mountain region and coordinated a 119-terminal Health, Education, Telecommunications (HET) Network in 23 states.

Involving numerous state and local professionals and technical specialists, a field services support network carried out the planning, development, and operational tasks of the STD. An evaluation effort was designed and implemented to determine whether results met objectives.

The results of the Demonstration and its implications for the future are well stated in a speech delivered July 21, 1975, by United States Senator Frank E. Moss, Chairman of the Senate Aeronautical and Space Sciences Committee:

> *I am convinced that the ATS-6/HET Experiment was the beginning of a new era in communications and progress in our social institutions. The question is — Where do we go from here?*

PREFACE

After years of cautiously probing outer space, man is now directing the experience and knowledge of his scientific discoveries toward earth. The concepts of space telecommunications are ready for practical applications so revolutionary that a generation of work may be required before the full potential is realized.

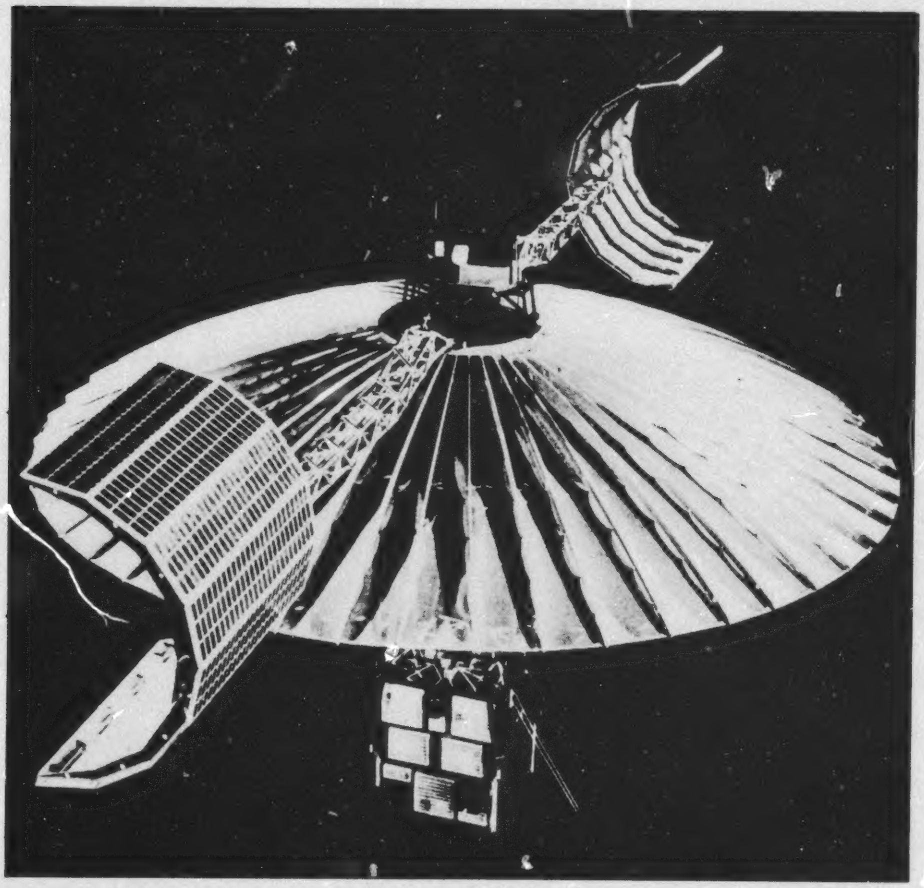
The Satellite Technology Demonstration was the beginning of that work. Nothing quite like the STD had been undertaken previously. The technical challenge was to develop a complete satellite broadcast system capable of transmitting educational and medical programs directly to rural schools, hospitals, and other users distributed over a large geographical area. The result of this pioneering endeavor was the design, installation, and operation of the largest non-military satellite telecommunications ground system in the world.

The agencies and people involved in the STD endeavor believed that such an experiment was necessary to gather and analyze information concerning the use of a satellite communications network and an associated human support system. The data in this report (the objectives and purposes of the Project; the planning, development, and operation of the system, products, and services; and the results, conclusions, and recommendations) will guide future decisions about investments of funds and other resources for satellite efforts in the United States and in countries throughout the world.

The Federation of Rocky Mountain States, Inc., the STD's parent organization, was established in 1966 as a partnership of six states — Colorado, Idaho, Montana, New Mexico, Utah, and Wyoming. Headquartered in Denver, Colorado, the purpose of the organization is to explore problems in the region and to promote the orderly development of its resources. Although not members of the Federation, Nevada and Arizona participated in the satellite demonstration.

As early as 1968, the Federation explored the possibilities for obtaining a satellite-based communications delivery services project for the Rocky Mountain states. In 1969, it submitted a proposal to the Department of Health, Education, and Welfare (DHEW) for a project to improve teaching in small, isolated communities in the region by broadcasting via satellite. At about the same time, DHEW began an investigation of the potential educational uses of National Aeronautics and Space Administration (NASA) satellites. In 1971, NASA accepted DHEW's request to make $2.5 million in alterations to the Applications Technology Satellite-6 (ATS-6). These alterations would enable the satellite to be used with a proposed low-cost ground-receiver system. During that same year, NASA and DHEW, working with the Federal Communications Commission, presented a proposal (through the U.S. Department of State) to the World Administrative Radio Conference (WARC), requesting a frequency allocation of 2.5 Gigahertz for a broadcasting-satellite service. This proposal was accepted and the frequency was allocated. Concurrently, DHEW's Office of Education awarded the Federation a contract "to develop and articulate the organizational structure and planning" for a satellite telecommunications experiment in the Rocky Mountain region.

Many other entities participated in this significant demonstration: DHEW's Office of Telecommunications, the offices of the eight governors and chief state school officers of the participating states; the Corporation for Public Broadcasting, the Rocky Mountain Public Broadcasting Network, and the public broadcasting stations in the region; and local school boards and superintendents and many other community leaders. Together the participants joined the Federation to build a human network of local, state, regional, and national support for an experiment involving, for the first time in man's history, the use of a satellite in direct, widespread educational and health applications.



The primary satellite used in the Demonstration, NASA's ATS-6, is one of the most complex, versatile, and powerful communications spacecraft ever developed. It and the other Applications Technology Satellites comprise one of the largest groups of a single class of satellites to be spaceborne at the same time. The first (ATS-1) was launched in December, 1966; the ATS-3, in November, 1967; the ATS-5 (the last prior to ATS-6), in August, 1969; and the ATS-6, on May 30, 1974.

In June, 1971, a joint proposal made to NASA by DHEW and the Corporation for Public Broadcasting (CPB) formed the groundwork for an agreement to use the ATS-6 for experiments to provide improved services in health and education to regions in the United States which are geographically remote from the benefits of social and technological progress. Alaska, the Appalachian region, and the Rocky Mountain states are three areas in this country where there are large numbers of people experiencing particular isolation and who are in need of enriched services in health and education. The ATS-6 represented a new technology capable of breaking through this isolation to deliver needed services. Conventional barriers in these regions to ground-based transmissions did not affect the satellite's powerful signals which permitted the use of ground terminals inexpensive enough to be installed in 119 small, rural communities.

For these reasons, one of the principal series of experiments supported by the ATS-6 was the HET (Health, Education, Telecommunications Experiments) through which DHEW, NASA, and CPB introduced new technologies and services to residents of remote areas.

The purpose of the HET was three-fold: (1) to demonstrate a satellite television distribution system at a cost and with the equality of access that would ensure its usefulness to such public services as health and education; (2) to explore technical and organizational mechanisms for dealing simultaneously with the need for high-quality audio-visual materials at low per-capita cost and with the desire to individualize services to meet specific local needs; and (3) to develop several technology-based system models for service areas where public commitment was evident but where no developed institutional operational arrangement existed.

One hundred nineteen installations, used in one or more of the HET Experiments, received television signals provided by the ATS-6. Basic at all 119 terminals were a television monitor, a converter,and an antenna. The antennas were installed either directly — each serving a single television monitor in a school, hospital, or community facility — or they were tied in with public broadcasting, microwave, cable, or translator systems already in operation in the participating states. Additionally, a number of sites in the Alaskan region had originating video capability which enabled both the transmission and reception of television via the ATS-6. Two earlier satellites, the ATS-1 and the ATS-3, were used for two-way voice and data transmission at 47 of the HET sites, enlarging the possibilities for transmission to include telephone, teletype, and computer data. Combined with ATS-6, these systems offered the HET Experimenters countless communications options.

Each of the six independently managed experiments comprising the HET network (which covered 23 states in the Rocky Mountain and Appalachian regions and in Alaska and the Pacific Northwest) were unique, having variations in program, audience, and equipment configuration.

The Indian Health Service (IHS), a division of the U.S. Public Health Service, conducted experiments in the delivery of health care and ntinuing medical education, principally at sites in Alaska. The IHS Office Systems Development and Analysis at IHS headquarters in Rockville, aryland, and its Alaska Area Native Health Service Office in Anchorage articipated.

The Washington, Alaska, Montana, Idaho Program (WAMI) engaged in e improvement of medical education in those states. In Washington and laska, WAMI conducted experiments in medical curricula, administration, omputer-aided evaluation, and community health. WAMI was headuartered at the University of Washington at Seattle, with coordinating fices at the Universities of Alaska and Idaho and Montana State niversity.

The Alaskan Education Experiment, which was under the direction of e Office of Telecommunications within the Office of the Governor of aska, provided culturally relevant educational and health training formation to various groups including small children, students, araprofessionals, and other adults.

The Veterans Administration, a fourth experimenter in the HET etwork, performed a series of biomedical communications experiments in hich major medical centers provided consultation and continuing ducation to VA hospitals in the Appalachian region.

The Appalachian Educational Satellite Project (AESP), under the irection of the Appalachian Regional Commission, was an experiment in e delivery of training programs in elementary reading and career ducation to Appalachian educators (teachers, counselors, and adninistrators). A Resource Coordinating Center (RCC) was established at he University of Kentucky in Lexington, Kentucky. The RCC developed the ourses, seminars, and information systems (including a computer retrieval ystem) which were delivered through Regional Education Service gencies (RESA's) to the participating educators at variously located erminals.

The Satellite Technology Demonstration (STD) delivered social services (education and health) to students, teachers, and community adults in the Rocky Mountain region.

As the operations manager for the HET terrestrial network, the STD was responsible for the day-to-day operation of this wide-ranging broadcast system. Through the Network Coordination Center (NCC) in Denver, which was developed and administered by STD personnel, the STD was the focus for receiving, monitoring, transmitting, relaying, and controlling all HET ground network activities throughout Alaska, the Pacific Northwest, the Appalachian region, and the Rocky Mountain states.

Through negotiations with the National Institute of Education, the Office of Education, and DHEW (Office of the Secretary), the Federation obtained total funding of $11,329,423 for the STD project, covering the four-year period from May, 1971, through September, 1975. The funding agencies and the Federation agreed that the services of the STD were to be based on the needs of the system's potential users and that the main emphasis of the Demonstration was to study and refine the delivery system technology and its potential applications to rural populations.

Negotiations with the federal funding agencies resulted in the following Project objectives: To demonstrate the feasibility of a satellite-based media distribution system for isolated, rural populations and to test and evaluate user acceptance and the cost of various delivery modes using a variety of materials.

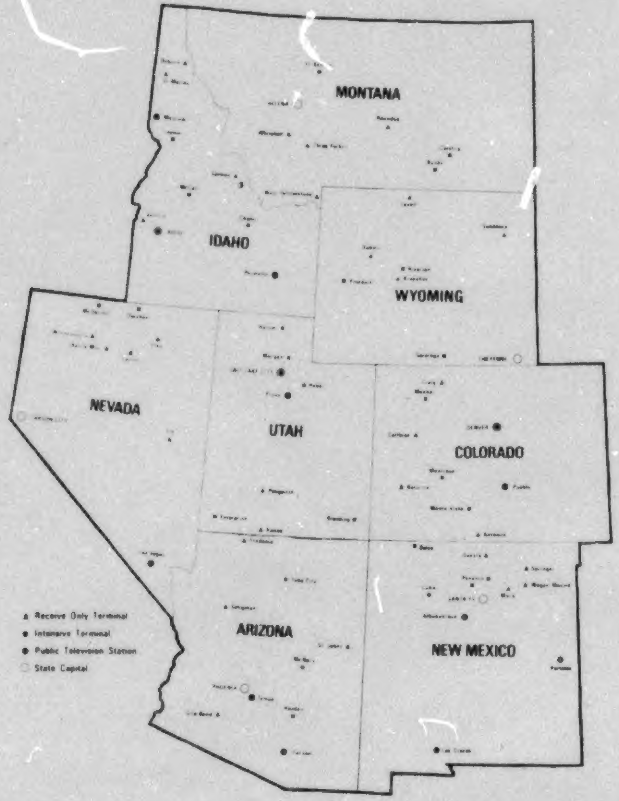
Project organizational divisions were defined on the basis of functions required to accomplish the STD objectives. These divisions were: Broadcast and Engineering (satellite-based ground distribution system); Program (content development and video production); Utilization (field support for implementation and audience participation); and Research (testing and evaluating acceptance and costs). Administrative functions included responsibility for overall Project policy and management, funding negotiations, budget design and financial control, public information activities, and operational interface with other Experimenters and agencies within or related to the entire HET system.

The STD management system was designed to meet Project objectives within a negotiated budget. A decision-making process was developed to maximize and control available resources and to accomplish specific tasks through resource allocation, task modification, and intercomponent coordination. The STD project used a decentralized functional structure and modifications of applicable management science approaches. Primary subsystems of the management process were (1) Task Structure and Control and (2) Budgetary and Financial Control. Specific techniques applied when appropriate included variations of the PERT system, linear programming, and general financial control systems. In most cases, this was the first extensive application of such techniques in a large-scale social project.

In February, 1972, the staff of the Satellite Technology Demonstration met with representatives of NASA, the Goddard Space Flight Center, and Fairchild Industries (the prime contractor for ATS-6) to initiate the critical task of designing the low-cost ground system equipment.

Working cooperatively with NASA and the HET Technical Committee, Denver-based STD engineers assisted in developing antenna-receivers costing approximately $4,600 each, including installation — the lowest priced operable equipment of its kind ever manufactured. Television programs originating in Denver were sent initially to a large transmitting "earth station" in the foothills near the city. From there the signals were relayed to the ATS-6. The satellite transmitted two high-intensity beams which formed two giant "footprints" on the earth, each approximately 500 miles long and 300 miles wide. These signals provided the region, and specifically its rural communities, with higher quality reception than that provided by conventional television to urban communities.

Identical programming was broadcast by the STD to both the eastern and western portions of the Rocky Mountains. When transmission to one area was completed, commands from NASA control at the Goddard Space Flight Center repointed the spacecraft, moving the transmission "footprints" to the other geographical area. Included in these coverage areas were 69 STD receiving terminals: 52 at rural schools, 1 at the University of Nevada at Las Vegas, 12 at public television stations in the region, and 4 at certain cable and translator systems to provide the programming to 4 other rural schools. By installing the receiving dishes at public television stations, the STD programming was made available to approximately 80 percent of the region's population.



Another satellite, the ATS-3, was utilized to relay audio signals to and from Denver, providing 24 of the school installations with an additional capability: two-way voice and data communications. This capability allowed "live interaction" to take place as students and teachers at the various schools talked to one another and with the specialists in Denver whose video images were being relayed simultaneously by the ATS-6. Two-way communications were also used to test the feasibility of transmitting data — mainly student responses to programs — from classrooms to a central computer in Denver.

The effectiveness of the STD system depended upon an accurate understanding of the people to whom the programs would be directed and of the environment in which the new technologies would be used and applied. To achieve this understanding, the STD established a field network throughout the region to channel materials, services, and information into the communities; and to convey reactions, information, and data from the communities back to the staff in Denver.

The Demonstration served an area which encompasses one-third of the land mass of the 48 contiguous states (860,000 square miles), broadcasting to rural communities which range in population from 100 to 8,000, with an average population of 1,850. About 30 percent of the nation's Native American population, most on reservations, live in the area (occupying 38,000,000 acres of land and representing over 30 tribes). The region also contains more than 30 percent of all Mexican Americans in the United States. The 56 school sites participating in the Demonstration were chosen because of both their isolated nature and diverse populations. People living in these communities include Native Americans, Mexican Americans, persons of Oriental origin, Blacks, and Anglos.

One of the Project's first major tasks was to develop a partnership among regional personnel, participating state agencies, and personnel at local sites. This partnership helped to establish and maintain the field network and also facilitated the next developmental step: the recruiting and training of indigenous staff to work directly with the STD project.

In each state, this primary task was the responsibility of a "state coordinator," a key person who had established ties with involved state agencies and who was also a direct link between the system and the people using it. Jointly employed by the state sponsoring agency — usually the state department of education — and the STD project, the state coordinator met with local school boards and community leaders, assisted in evaluation studies, and supervised the support efforts at local sites. At each of the 56 rural schools, a designated local "site coordinator" was trained to operate the technical equipment, distribute support materials, utilize local resources, and especially to act as a liaison between the school and the state coordinator.

The field network was an effective support system, facilitating not only the delivery of STD programs but also television specials of a topical nature (e.g., a live feed at the annual Federation meeting, a report on the Viking Mars Project, a presentation for the National Association of Educational Broadcasters' Convention, and the Emergency Medical Training series funded by the Robert Wood Johnson Medical Foundation, the Mountain States Health Corporation, and the participating states).

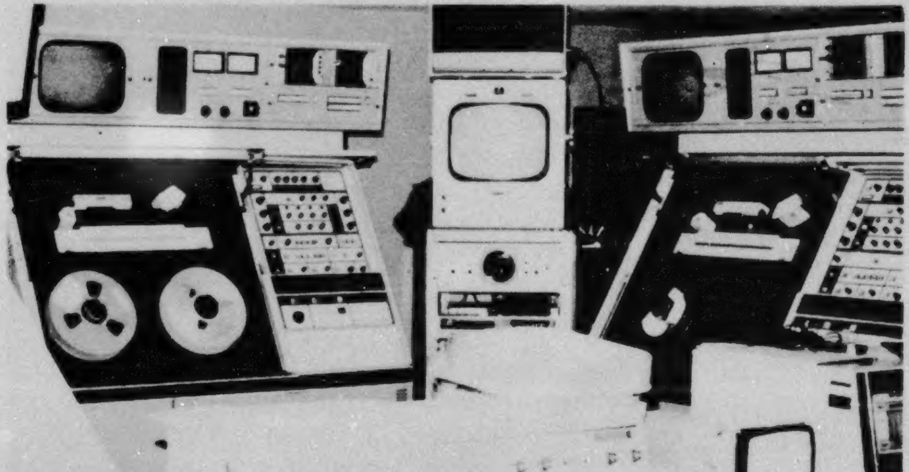
A needs assessment, including field surveys, verified the types of programs to be broadcast over the STD system and the specific audiences to which these programs would be directed. This effort identified the primary audience as junior high school students in the 56 rural communities, the secondary audience as teachers and adult members in these communities, and the open audience as thousands of persons receiving the programming via public television stations. These audiences received three television series — "Time Out," "Careers and the Classroom: A New Perspective for Teachers," and "Footprints" — as well as supportive print materials and additional satellite distribution services.

"Time Out" (J-Series), a 35-minute program, broadcast career education information Monday through Friday to junior high school students. In addition to pre-taped dramatized program segments, "live interaction" allowed students at the two-way sites to ask questions of specialists in Denver, to receive immediate responses via satellite, and also to talk with students at any other two-way site. The "Time Out" series emphasized self-assessment, career exploration, and decision-making skills and stressed the career options facing each student in relation to individual needs and capabilities. By presenting meaningful and entertaining broadcasts, the STD project enhanced adolescents' abilities to make important career decisions.

"Careers and the Classroom," an in-service training program, was designed to serve classroom teachers and school administrators — professionals at the rural sites who are often isolated from institutions of higher education. Through various colleges in the region, credit and/or recertification was made available to most persons participating in this series.

"Footprints" was a series of community-oriented adult programs on a variety of topics — including strip mining, agri-business, consumer mail-order problems, and health care. The format of these programs consisted of pre-recorded visual materials followed by a moderated panel discussion with experts who also engaged in live interaction with the adult audiences.

An additional service was the "Materials Distribution Service" which broadcast commercial instructional films (K-12) on a wide variety of topics for real-time use or for videotaping and later playback by the schools. Four hundred twenty-six films were made available to participating sites through one-year contracts with the Great Plains National Instructional Television Library and the Encyclopaedia Britannica Educational Corporation.



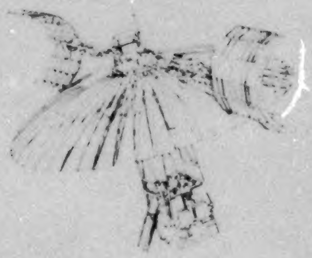
The STD project involved the design and implementation of an extensive evaluation effort intended to: (1) provide assistance in making management decisions regarding the formative development of STD products and services; (2) accomplish the "test and evaluate" task; and (3) determine whether or not results met objectives. The evaluation plan involved the development of a broad data base to ensure documentation of every potential benefit of the Project. A Research Advisory Board, composed of nationally prominent professionals, was created to complement the STD's in-house evaluation.

The STD evaluation developed an information base from six interdependent studies:

1. **Hardware**, including the performance and effectiveness of the system as well as the reliability of the equipment;
2. **Acceptance**, including the attraction and holding of and acceptance by specific audiences;
3. **Student Learning Gains**, including gains in student knowledge and attitudes;
4. **Case Studies**, including observations of specific institutional and behavioral changes at selected sites;
5. **Significant Events**, including an historical account and chronology of events critical to the development and implementation of the STD;and
6. **Costs**, including documentation and analysis of costs incurred in providing selected products and services.

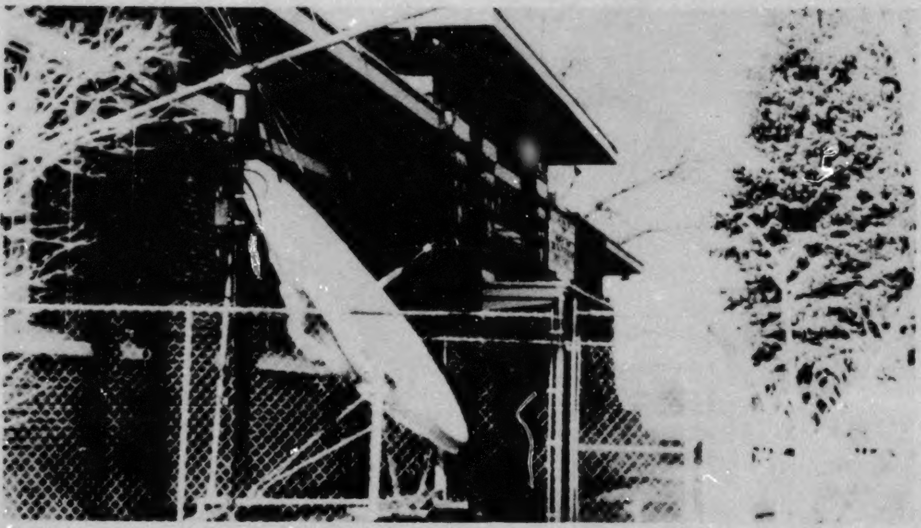
The information was gathered using such accepted data collection techniques as questionnaires, participant observation, interviews, STD-designed instruments, and a nationally standardized test, **Career Maturity Inventory** (John Crites, McGraw Hill Publishing Co., 1973).

The following document tells of a massive four-year effort to apply recently developed space technology to practical social problems for the immediate benefit of mankind. It is a success story, not without setbacks, but with prospects for a bright future. The final chapter of the Satellite Technology Demonstration will depend upon the recognition by both private industry and government of the need to continue the development of operational satellite communications systems for the general public.



OBJECTIVES AND PURPOSES

Because of the continued reductions in funding levels, changes of sponsoring agencies, shifting of responsible personnel within the agencies, and general vacillation at the federal level, federal planners were not consistent in the requirements made of the regional institutions accountable for specific demonstrations in the HET. From March, 1971, through December, 1974, more than 27 major changes in federal policy resulted in conflict between user expectations and the objectives of the various funding agencies. Crippling reductions and delays in payments, failure to clear frequencies, contradictory recommendations, and tardiness in making decisions undermined Project efforts. All major goal changes, funding reductions, and payment delays were made unilaterally by one or more agencies at the federal level. This bureaucratic syndrome characterized by federal indecision has undergone no change during the Operational phase of the Project.



FEDERAL/REGIONAL/STATES/LOCAL OBJECTIVES

FEDERAL

Federal objectives for the Health, Education, Telecommunications (HET) Experiments can be categorized as the need to: (1) obtain information to guide national policy and resource allocations in the area of education; (2) define a strategy for federal investment in satellite technology; and (3) direct satellite technology and related developing areas (such as cable communications, broadcasting, and computer technology) toward urgent social needs. The contrast between these objectives (educational, technological) should be recognized; they penetrated numerous areas of the HET Experiments and precipitated incongruent federal, regional, state, and local objectives during the early planning phases.

Long-range federal objectives relating to the technology were identified specifically by Dr. Albert L. Horley, Director of the Office of Telecommunications, DHEW, during the Seventh Annual Meeting of the Federation in 1971. In his statement, Dr. Horley indicated that the government was trying to develop "a strategy for investment in technology that [would] provide a major pay-off in terms of either extended service capability or in terms of reduced cost in providing current services." Dr. Horley, also Chairman of the HET Policy and Technical Committee, visualized a long-range experimental program which would entail several phases. The HET Experiments, representing the initial stage, were designed to gain information on the feasibility and effectiveness of satellite and related technologies in the delivery of social services. A second phase was to be the motivation of public acceptance and the creation of demand for applications. A third phase was to be the development of an operational system jointly implemented by both industry and government.

Educational objectives for the Demonstration at the federal level also centered on testing the feasibility of the technology, but with a concern for educational productivity, primarily in such areas as the delivery of services to rural, isolated populations. The U.S. Office of Education stated in a February 27, 1973, letter that the Project was:

> *. . . an experiment that is intended primarily to demonstrate the cost effective delivery of technology-based, educational courseware to relatively small numbers of television-isolated persons who may only be reached through a satellite.*

Subobjectives of the federal agencies can be recognized from their decisions to:

(1) delegate decision-making to regional and state institutions (e.g., contracting with the Federation, a policy-level regional organization, for a major portion of the HET responsibilities);

(2) involve users in the design process (e.g., providing STD field support funding);

(3) expand available program offerings and provide comparison with existing terrestrial distribution methods (e.g., incorporating an educational materials distribution service); and

(4) emphasize technology rather than educational content (e.g., authorizing the STD to establish an independent regional satellite communications and control network and simultaneously reducing funding for program production).

REGIONAL

The federal government's objective to acquire information which could be used to guide national policy in education initially appeared to be consistent with the objectives of the Federation. As a regional organization, the Federation's purposes are to identify problems common to its Rocky Mountain member states and to assist the states' public and private sectors in dealing with these common problems and opportunities. Although each of the states and municipalities has some unique characteristics, the overwhelming problems in education, health, transportation, communications, land use, resource management, environmental control, and law enforcement do not respect legal or geographic boundaries nor do they easily lend themselves to parochial solutions. Therefore, the Federation's objectives in the early 1970's appeared to be clear: to show that contiguous communities of interest could be served effectively by satellite technology and that public acceptance of the technology would be increased. This purpose was to be achieved within a framework which would allow new, cooperative arrangements to develop among the member states and their institutions.

Specifically, the Federation's interest in sponsoring the Satellite Project was to use satellite communications to provide social services to the rural communities of the member states. The planning requirements of the states made it imperative that as much information as possible be made available to them early in the life of the STD so that necessary state legislation and funding for the use of future satellites (ATS-G, H) could begin during calendar year 1975.

Because establishing the use of satellite technology in state agencies was clearly necessary, the Federation identified agencies and personnel to accept the responsibility for maintaining the STD's visible presence in the govermental structure of the state; and through public information efforts, to bring the potentials of satellite telecommunications to the attention of state lawmakers and governmental officials.

Concerned with the states' historic over-dependence on the federal government for leadership in policy- and decision-making, the Federation sought to reconfigure federal-regional-state relationships and introduce a public and private sector partnership in the development and use of advanced communications technology. This consolidated effort would make it possible to use resources at the state and federal level, as appropriate, to address specific, jointly determined needs.

The Federation, recognizing the opportunity (through the STD) to augment ongoing regional programs, described its expectations in the following statements:

1. A sophisticated communications system (such as the Applications Technology Satellite ATS-6) linked to existing ground facilities (such as broadcast television, Community Antenna Television [CATV], and microwave systems) would form the basis for designing new ways to apply knowledge to persistent social problems, particularly in the field of education.
2. The federal and state governments would gain important information about the effectiveness of such a communications system, the costs inherent in the expansion and modification of such a system, and a generally reliable measure of the public acceptance of such a system. This information would be crucial in determining future investments.
3. The use of a substantial and flexible telecommunications system as a resource in the rigorous planning, operation, and evaluation of educational programs based on user needs would allow institutions to develop new ways of providing effective and efficient services because of the increased availability and accessibility of new knowledge. It would facilitate interagency planning and program operation as well as improved state and regional planning capability.
4. A significant demonstration of the potential effectiveness of a user-based instructional system employing available technology would encourage the private sector to expand and develop new ways to provide social services. Goods and services could be designed to meet user needs and, simultaneously, take advantage of the economic efficiency of a large-scale delivery system.

STATES

The motivation of the states to participate in the STD varied. At the state executive level, participation was endorsed in an effort to further legislative goals. At the state education department level, the agency's reason for participating was its interest in furthering specific instructional goals. The state education agencies expected the STD to assist them with the development of career education curricula. Since the states' career education staff capabilities were often only partially developed, several states welcomed the STD as a resource which would aid their efforts in providing in-depth field consultation in career education to participating local schools. In one state in which the STD project was administered by the state's Educational Communications Commission, STD goals and anticipated products and services were perceived as a means of encouraging continuous development of the communications capabilities of the state. In no known case were the states' motivations entirely consistent with federal funding agencies' expectations.

Six of the eight STD states' governors had already committed themselves to Federation policies and programs which were designed to place the region in a more self-reliant and policy-determining position. Some progress had already been made by the participating states and, therefore, the planning for this large-scale communications project represented an extension of policies and efforts already agreed upon by state executive officers.

No predetermined state goals were imposed on the STD by the states' governors. The STD was considered to be a short-term experiment whose major thrust was to gain information about the delivery by satellite of limited social services to rural audiences. The Project was not regarded as an operational service which a state was asked to support.

LOCAL (SCHOOLS)

Local school operations do not accommodate easily short-term research or demonstrations. Nonetheless, the schools embraced the STD for the usefulness of its products and services, which they perceived to be helpful in the support of their instructional goals. The local educators and communities did not embrace the major objectives of the STD because meeting these objectives required the skills and capabilities of federal, regional, and state agencies and organizations. Additionally, the technical objectives of the STD were, by their nature, not those which a local school district would be expected to endorse. Therefore, the role of the local school district was that of a cooperative user rather than that of an advocate.

In five of the STD participating states, a mandate existed that career education instruction be operational by the school year 1975-76 at the junior high school level. Since the deadline for meeting this requirement was unrealistically short, the STD's career education programming was welcomed by the schools as an available instructional template. School districts in several states were concluding local needs assessments which reflected the need for career education curricular and instructional development. As viewed by local educators, the STD's proposed programming would help them comply with their own needs assessment.

Other objectives expressed by the local schools were to: (1) participate in a visible, important national project; (2) acquire instructional materials at greatly reduced or no cost; (3) acquire staff competencies in a relatively new curricular and instructional area; and (4) assist the state education agency to fulfill its state objectives in behalf of the state's schools.

It is generally recognized that, until recently, local school operations have not been characterized by rigorous planning. Local expression of educational goals has alternatively reflected pupil- and community-based wants, state mandates, and federal funding opportunities. It is not likely that a local school district, even after conducting a necessary and exhaustive needs assessment, would emerge with goal and objective statements supportive of regional resource development. Rather, the statements would reflect pupil, teacher, and local patron expressions of needs and goals, oriented toward local academic, maintenance, and service functions. It may be said that the schools regarded the STD as a means of furthering these functions and of assisting their state agency to achieve state goals.

SATELLITE TECHNOLOGY DEMONSTRATION OBJECTIVES

CHANGES IN FEDERAL PURPOSES AND OBJECTIVES

Because of the continued reductions in funding levels, changes of sponsoring agencies, shifting of responsible personnel within the agencies, and general vacillation at the federal level, federal planners were not consistent in the requirements made of the regional institutions accountable for specific demonstrations in the HET. From March, 1971, through December, 1974, more than 27 major changes in federal policy resulted in conflict between user expectations and the objectives of the various funding agencies. Crippling reductions and delays in payments, failure to clear frequencies, contradictory recommendations, and tardiness in making decisions undermined Project efforts. All major goal changes, funding reductions, and payment delays were made unilaterally by one or more agencies at the federal level. Conversely, no significant policy or funding change was made at the regional or state level. During these initial years, the STD funding requests, motivated initially by federal guidance were reduced from $26 million to $11.3 million through 21 formally submitted proposals. Indecision characterized the changes, divergent perceptions across agencies, and inconsistent guidance received from initial federal management. This bureaucratic syndrome characterized by federal indecision underwent no change during the Operational phase of the Project.

EVOLUTION OF STD OBJECTIVES: 1969-1973

A chronology of events serves to illustrate the effect of federal decisions in defining the final Project objectives:

The announcement in 1969 that the National Aeronautics and Space Administration (NASA) was planning to launch the ATS-6 prompted the Federation, in cooperation with the Western States Small Schools Project, to investigate the potential of using the satellite and its associated ground distribution systems to provide high-quality, low-cost public services (particularly in the field of education) to rural, isolated constituencies. The 1969 Federation proposal contained the objective "to improve educational opportunities in isolated, small schools in the Rocky Mountain region." The proposal was not funded. The reason given was that the rural, isolated school community provided **too small a population base** to produce sufficient data about a large-scale communications system.

In early 1971, the Department of Health, Education, and Welfare requested that the Federation submit a proposal for use of some of the broadcast time on ATS-6. In March, 1971, the Federation submitted a plan which included programming for career education, early childhood development, and higher education, and called for a significant cooperative effort among the Education Commission of the States, the Western Interstate Commission on Higher Education, and the Federation. As a result, NASA included the educational experiments on ATS-6. Meanwhile, an agreement (cited in a DHEW proposal to NASA, dated April 8, 1971) among the chief executive officers of NASA, DHEW, and the Corporation for Public Broadcasting specified that the Federation "would distribute programs in occupational skills, secondary school science, and inter-university networking" to **communities in the sparsely populated** Rocky Mountain area.

The Office of Education awarded the Federation a planning grant (contract) in May, 1971, to prepare for the satellite experiment.

The Federation proposal (July 17, 1971) resulting from this contract requested $26 million to carry out the activities as planned by the regional organizations and envisioned by the federal agencies.

In October, 1971, DHEW's Office of Education responded to this proposal by making a "commitment" of $5 million (FY 1972) for a limited "experimental demonstration" to include career education and early childhood development programming. Federal responsibility for the Project and specification of goals of the Project were not decided upon.

A revised planning proposal for $800,000 was submitted in January, 1972, and a planning grant of $500,000 was awarded. The proposal constituted an agreement which contained the following provisions: content areas would be career education and early childhood development; a production-engineering component would be responsible for ground-system equipment and all production; most programming would be new, some would be existing; and programs would make extensive use of two-way communications. Engineering plans, according to the agreement, were based on the assumption that program transmission would include public broadcasters in the region, Community Antenna Television (CATV) and translator systems, and a few individual sites unreachable by existing systems. Planning addressed one-way video, two-way video,one-channel audio, four-channel audio, Computer-Assisted Instruction/Computer-Managed Instruction (CAI/CMI), and remote uplink video/audio mixes to be used by the sites.

Under the original plan, most production was to be subcontracted and the STD was to have only a limited production facility. In July, 1972, this plan was reconfirmed (with one exception) in a conference with the Office of Education; however, authorization for the studio was withheld until June, 1973.

On June 1, 1972, a revised planning proposal (which was to further narrow the scope of the Project's objectives) was requested by the Office of Education. On June 25, 1972, the revised proposal was sent to Washington. On July 7, the Department of Health, Education, and Welfare requested further revisions; these were made and sent to Washington on July 28, 1972. DHEW's budget had not been approved by the President and no contract was in place for FY 1973. The Project was supported under continuing resolutions at the previous level of the planning grant — a funding level too low to launch the developmental phase of the Project which was to begin on July 1, 1972.

In January, 1973, a decision was made by the Interagency Radio Advisory Committee (IRAC) and the Federal Communications Commission (FCC) not to clear the 2.25 GHz frequency which was to be used for the uplink (earth-to-satellite) portion of two-way video broadcasting. Since ATS-6's transponders had been designed by NASA-Fairchild in 1971 to use this frequency, it had been assumed that FCC and IRAC clearance had been obtained previously. This event modified an important objective relating to two-way communications by prohibiting use of the ATS-6 for audio, video, and digital interactive purposes by remote locations in the continental United States.

Following a February 3, 1973, meeting of the Office of Education's subtask monitors and the Project staff, a directive was issued by the National Center for Educational Technology (NCET) which led to the cancellation of all new script production in both the early childhood and career development component areas — an event which affected practically every aspect of the Project.

In mid-February, 1973, DHEW's Office of Education staff notified the Project that the production of video courseware must be limited to "live" or short-lead-time production and that considerable audio interaction should be included in courseware design. They also confirmed the Project's selection of remote audiences. Additionally, Project staff was instructed to proceed with the planning for a medium capability studio facility and to purchase equipment to access the ATS-6 and equip a network control center.

In April, 1973, responsibility for the Project was transferred from DHEW's Office of Education (NCET) to the newly created National Institute of Education to become effective in July, 1973. An NIE review team visited the Project during that month and their report was critical. They recommended Project staff reorganization and substantial changes in content objectives and production.

In June, 1973, subsequent negotiations with the new sponsoring agency (NIE) resulted in the elimination of the early childhood subcontract with the Education Commission of the States. The research staff was centralized into a single component and given directions to create a new evaluation design. Budget cuts and resignations reduced the Project staff from 100 to 64. As fiscal year 1974 began, discussions continued between STD leadership and federal officials to conform the nature and scope of the Project to the revised objectives.

EFFECT OF FEDERAL INDECISION ON PROJECT PLANNING AND DEVELOPMENT

The primary effect of the lack of federal and regional agreement on Project objectives was to penalize subsequent development. Project operations were continually interrupted, frustrated, and in some cases completely negated. It was necessary to clarify, redefine, and analyze specific statements and considerations of Project objectives and at the same time carry on Project tasks to meet critical deadlines.

The following examples epitomize the consequences of federal vacillation on Project activities:

Initially, Project personnel were committed to the design and operation of such innovative technological capabilities as two-way video transmissions and real-time digital communications. Further, the Project's content development area initially included three varied and independent areas: career education, early childhood development, and higher education. STD plans included the testing and evaluation of all Project elements across varied audiences and institutions to encourage public acceptance and coordinate institutions and legislative action. The HET Experiments were perceived by all participants as a new exploratory venture, requiring an unconstrained search for innovation, an investigation of as many questions as possible, and planning for a wide variety of services.

However, the disparity between these plans and the objectives of federal agencies became policy issues which affected all Project activities. Operating under the federal government's "Continuing Resolution" for DHEW (no cash flow) for federal appropriations led to an atmosphere in the fall, 1972, of incongruity and discord between regional planners and federal policymakers. Critical decisions about design parameters were delayed, affecting numerous related activities. For example, as early as June, 1972, the STD had plans to subcontract video production through regional public television stations and film companies; the production schedule was to be initiated in January, 1973, after Project staff had completed a needs assessment to define content structure and educational objectives. This schedule was implemented; eight subcontracted program segments were near completion when the federal sponsoring agency, in February, 1973, directed the STD to cancel all production subcontracts. Not until June, 1973, did the STD receive authority to let bids for an in-house production capability (television studio); however, expenditures for the facility were further delayed — to September, 1973. This interim period, from February to September, 1973, was one of indecision which affected the entire following year's developmental activities.

Furthermore, the delayed studio decision made the facility operational at such a late date that testing student programs as prototypes (previously scheduled for spring, 1974) was seriously curtailed; production delays resulted in an insufficient number of video programs for testing. Consequently, it was necessary to redesign the first semester of broadcasts into a "formative" semester to gather information for program improvements for the second semester of broadcasting.

EFFECT OF CHANGES IN OBJECTIVES ON SITES

As a result of these federal changes in policy, the STD was unable to meet the following specific expectations of the states and sites:

1. The STD, and in turn the local schools, anticipated that they would use two-way video. This feature of the Demonstration would allow for some localizing of the programs and for career education resources (where these existed) to be brought to the remaining sites. Failure to clear frequencies prevented this feature from being used.
2. Approximately one-third of the STD sites joined the Demonstration primarily to participate in early childhood development programming. When federal funding reductions and consequent changes in Project scope eliminated this content area, these sites agreed to remain with the Project although programming would be in their second-choice subject matter, career education.
3. Sites expected that use of the multi-channel audio capability inherent in the design of the ATS-6 would provide greater freedom of access for questions and discussion ("interaction") than was possible through use of the one-channel audio capability of the ATS-3. Few facts about audio interaction were available to STD during this period (January to October, 1973) which could provide guidance to schools which faced decisions about participation. (See "VHF Transmitter-Receiver Terminals" in Section IV.)
4. Although sites did not expect to use computer-assisted instruction, they did expect some limited experimentation in the use of the digital interaction capability of the ATS-6. Frequency allocation misunderstandings, mentioned earlier, prevented use of the ATS-6's digital and voice interaction capabilities.
5. During the planning period, the sites were made aware of the multi-channel voice capabilities of ATS-6. It was suggested on several occasions that these multiple channels probably would be used to provide multi-language broadcasting to those sites which contained significant members of Spanish speaking and Native

American students. Funding reductions eliminated multi-lingual programming.

6. State agency officials and site personnel had been assured by the STD that most, if not all, programs and program segments would be field-tested. The STD had promised to and agreed with potential sites that all video materials would be reviewed prior to broadcast. However, the previously mentioned production delays prohibited field-testing of all program segments; it was not until spring, 1974, after the close of schools, that selected segments were piloted. Consequently, schools participated in the STD without knowing program length, frequency, or specific content.

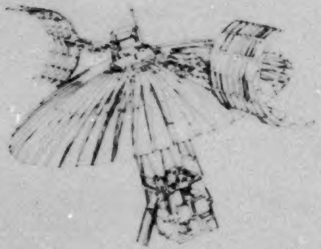
There were justifiable reasons for the STD's inability to meet these specific expectations. (See 1-6 above.) Basic to the early planning for the Project — and communicated to the potential sites — was the federal government's **expressed initial interest** in and emphasis on technology (e.g., two-way video, computer interaction, multi-channel capability) and its attendant software needs. The later federal mandate for a reduction in scope of the HET Experiments resulted from the previously discussed changes in agency, personnel, and objectives at the federal level. These constantly changing federal objectives had no effect on hardware system funding but did have a negative and lasting impact on the quantity and quality of the program content created for users.

RESOLUTION: JUNE 1973 MEMORANDUM OF UNDERSTANDING

The STD's operational objectives evolved from two years' negotiation and compromise with federal sponsors which reduced a previous commitment of $7 million to $4.5 million for the remainder of the Project (FY 1974-1975). In a **Memorandum of Understanding** written in June, 1973, and agreed to by NIE and the Federation, two objectives were defined:

1. to demonstrate the feasibility of a satellite-based media distribution system for rural populations; and
2. to test and evaluate user acceptance and the cost of various delivery modes using a variety of materials.

The resolution of the issue of these broad objectives, however, did little to simplify their attainment nor did it create understanding among the sites, the Project, and the federal sponsors. Nonetheless, the objectives were achieved successfully, a process which is documented in the following pages of this report.



PLANNING/ DEVELOPMENT/ OPERATION

The STD was an experiment to extend social, education, and health services into rural communities in the Rocky Mountain region.

This section describes the massive undertaking required to organize, coordinate, and manage a multi-disciplinary professional staff; develop, install, and operate the communications network; encourage the interest of and participation by thousands of users and to coordinate the multi-level community, state, and federal agencies and the private sector; develop hundreds of segments of video programming; and design and develop a comprehensive evaluation plan consisting of six major studies.

ORGANIZATION AND MANAGEMENT

The STD was a unique project which required a unique management system to assure its successful completion. Project administration carefully assessed the rather atypical organizational characteristics of the Demonstration and drew from available management science knowledge to design its management system.

The resultant management system supported the STD's mission and assured completion of the many and diverse Project tasks. The implementation of the management system depended upon open and candid sharing of perceptions, problems, and attitudes among personnel. This sharing was facilitated by rather high levels of trust and confidence among personnel that decision-making would be based on accurate and timely feedback concerning Project and personnel needs; this kind of project climate is basic and essential to successful management systems.

The purpose of this section is to review the management system developed and implemented in the STD. This review will provide useful information for those concerned with project accountability and also for those who might design management systems for subsequent projects of a similar nature.

KEY CONSIDERATIONS IN THE DESIGN OF THE MANAGEMENT SYSTEM

The design and implementation of effective project management systems is a critical problem. The STD faced a set of conditions which required a creative response if the Project were to be managed effectively. The traditional bureaucratized management approaches, with their institutionalized roles and line and staff structures common to stable and enduring organizations, were not appropriate for the STD. The key factors which called for a creative management system were:

1. The Project was established as a short-term "demonstration" with defined goals and carefully prescribed and negotiated resources.
2. The Project's personnel were highly skilled and creative with a propensity for risk-taking.
3. Responses to Project-related problems had to be quick and effective. There could be no gap between responsibility and decision-making authority.
4. The Project's activities were highly visible and interfaced with a number of established political organizations within the region.
5. The nature of the funding required immediate and accurate responses concerning the status of the Project's many activities and its fiscal condition.

In many ways, the STD faced the conditions that Bennis had forecast for organizations of the future (Bennis, Warren G. **Changing Organizations**. New York: McGraw-Hill, 1966):

1. Rapid technological change and diversification will lead to interpenetration of the government and legal and economic policies in business. Partnerships between government and business will be typical.
2. The general population will be characterized by increased education and job mobility.
3. People will be more intellectually committed to their jobs and will require more autonomy, involvement, and participation in their jobs.
4. The task of the firm will be more technical, complicated, and unprogrammed.
5. The organization of the future will be an adaptive, rapidly changing, temporary system which will be organized around problems to be solved.

The STD management system was designed to attain a set of objectives and to produce the best quality of products and services possible within the constraints of budgeted resources and negotiated objectives. The management system sought to maximize and allocate resources to accomplish specific tasks which were derived from the Project's objectives.

The two major subsystems of the general management system were: (1) Task Organization and Control; and (2) Budget and Fiscal Control. Within these two subsystems, several management techniques, derived from contemporary management research, literature, and practice, were applied, including Program Evaluation and Review Techniques (PERT), Linear Programming, and General Financial Control Systems.

The STD Project management system and a description of its development have been presented in the following sections.

THE STD ORGANIZATION STRUCTURE

Organizational planning for the STD was conceptualized as a process of translating Project objectives into functional groupings of tasks and related responsibilities. The responsibilities concerned decision-making processes and authorities, overlapping spheres of responsibility, and transmittal of timely and accurate feedback to appropriate units within the Project.

Two key considerations in designing the organizational structure were: (1) whether units should be organized around products or functions; and (2) how to force decision-making downward while still retaining control and direction of the Project's activities at the central level (Administration). These considerations were made more complex with the realization that the Project's activities would shift over time from planning through development to the operational stage. The STD had to be organized with this planned evolution in mind, while assuring a goal reference and taking into account the resources available, the behavioral characteristics of STD personnel, and the environmental settings within which they would work.

There was no generic model that the STD could import and apply: It was unique and its organization had to be uniquely structured.

PROCESSES USED IN DESIGNING THE ORGANIZATIONAL STRUCTURE

A five-step process was used to design the STD project structure. The process called for the:

(1) formulation, clarification, and specification of objectives;

(2) identification of alternative structures to attain the objectives;

(3) analyses of alternative structures in terms of their behavioral benefits;

(4) selection of a preferred structure to meet the unique requirements of the STD; and

(5) operationalization of the preferred structure.

The term, "objectives," referred to the outcomes which the Project had to realize over a specified period of time to be judged successful. The STD, as opposed to stable and enduring organizations, had objectives which were clarified and validated through formal negotiations with federal funding agencies. These objectives, which were negotiated in June, 1973 (18 months after initial funding was approved), were applicable to the remaining two-year life of the Project, and the operational tasks to be accomplished were implicit in the objectives. The two negotiated objectives were to:

(1) demonstrate the feasibility of a satellite-based media distribution system for isolated, rural populations; and

(2) test and evaluate user acceptance and cost of various delivery modes using a variety of materials.

The major task requirements of the STD were implicit in these two objectives. They called for the development of the capability to access a satellite and to supply program materials to a ground-based media delivery system; in other words, a satellite ground communications network was to be operationalized. The second objective called for the development of instructional materials appropriate for the region's educational needs and for the evaluation of users' acceptance of these materials.

The following functional areas were derived from the Project's objectives:

(1) developing the satellite communications network (Broadcast and Engineering);

(2) developing the testing and evaluation of instructional materials (Research);

(3) developing instructional programs: content and video productions (Program); and

(4) assuring field support for implementation and audience participation (Utilization).

These four functional areas constituted the basic organizational structure of the STD. The selection of a function approach to organization was made after considering several alternative approaches: For example, the Project could have been organized around products, locations, processes, time, etc. However, the functional approach was the most feasible in terms of the Project's specified short-term objectives, the highly skilled technical personnel and the need to tap their creative talents, the need for high levels of personnel motivation and "self-responsibility" behaviors, and the lack of an established support system within the parent organization, the Federation. This last consideration is not meant in a negative sense; the Federation plays an integrative role in the Rocky Mountain states and seeks to identify and examine policies, problems, and resources of concern to the region. It does not maintain operating units in research, engineering, or production of instructional materials with which the STD could interface. This required the STD either to develop its capacity to function in these areas or to subcontract with existing agencies to meet its needs in these areas.

A fifth function, Administration, was added to the four functions derived from the objectives. The administrative function was necessary to oversee Project management and control, to integrate functional activities, to clarify objectives and responsibilities, to maintain an environment conducive to motivation and high performance, to manage inter-agency relations, to provide public information about the Project's activities, and to assure fiscal practices consistent with acceptable accounting policies and practices.

These five functional areas were not specified at the outset of the Project, but evolved after the operationalization of the Demonstration. For example, during the Planning phase, "Content Development" was regarded as a separate function. Subsequent to June, 1973, it was merged into a newly created function, "Program." The merger was necessary because by this time the functional area of Content Development had accomplished its tasks of identifying audience paticipation and instructional objectives. A newly negotiated funding agreement called for elimination of the early childhood development focus, for an emphasis on career education, and for the production of video materials within the Project as opposed to subcontracting for these with other agencies. Also, in June, 1973, "Research" was designated as a functional area to meet the need to design, implement, and document a formal evaluation plan. Prior to this time, evaluation and research-related activities had been carried on within each of the other functional components, an arrangement which did not make efficient use of the STD's scarce resources and which led to overlapping of authority and responsibility.

In summary, the STD was organized around five functional components: Broadcast and Engineering, Research, Program, Utilization, and Administration. The functional approach to organization was viewed as the most appropriate structure, given the constraints of specific objectives, time, carefully defined budget resources, the nature of the STD personnel, and the environment in which the Project functioned. (See Figure 1.)

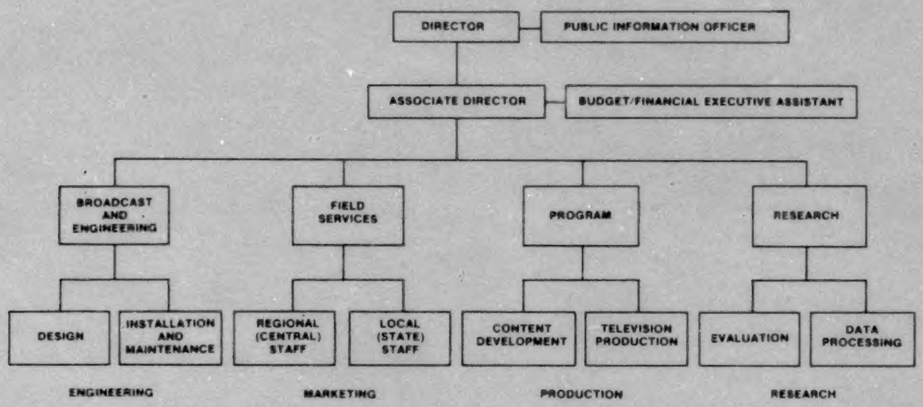

DIRECTOR
PUBLIC INFORMATION OFFICER
ASSOCIATE DIRECTOR
BUDGET/FINANCIAL EXECUTIVE ASSISTANT
BROADCAST AND ENGINEERING
FIELD SERVICES
PROGRAM
RESEARCH
DESIGN
INSTALLATION AND MAINTENANCE
REGIONAL (CENTRAL) STAFF
LOCAL (STATE) STAFF
CONTENT DEVELOPMENT
TELEVISION PRODUCTION
EVALUATION
DATA PROCESSING
ENGINEERING
MARKETING
PRODUCTION
RESEARCH

FIGURE 1
STD FUNCTIONAL ORGANIZATION STRUCTURE

THE STD PROJECT MANAGEMENT SYSTEM

The development of a management system to meet the unique needs of the STD and its personnel was a critical task. Administration recognized the need for highly skilled personnel to function with a high degree of autonomy and high motivation levels in performing their tasks and attaining functional component objectives. At the same time, the need for timely and accurate feedback on performance and on serious deviations from charted paths was recognized by Administration. The outcome of these recognized needs was in effect a management by exception system related to Task Organization and Budget Control. The intent was to develop function and subfunction objectives, tasks, and related personnel performance along with budget allocations within defined ranges of acceptability. When performance, outcomes, or resource consumption deviated from this range of acceptability, Administration played a central role in modifying, redirecting, and in some cases validating the deviations.

The two primary management subsystems, Task Organization and Budget Control, were effected through the extensive use of management meetings and required reporting. Also, Administration made use of Task Forces comprised of personnel from throughout the Project. The Task Force approach enabled the STD to solve unanticipated problems using the creative human resources of the Project.

THE TASK ORGANIZATION MANAGEMENT SYSTEM

The purposes of the Task Organization management system were to:

(1) translate Project objectives into personnel activities;

(2) identify the major areas of overlapping functional component activities;

(3) develop specific statements of tasks, activities, schedules, and time constraints; and

(4) provide the functional area of Administration with timely and accurate feedback.

Within each functional area, general objectives and tasks were derived from the contractual agreements between the STD and its funding agencies. More specific task statements were developed around the three stages of the Project: Planning, Development, and Operation. From 10 to 20 subtask statements were developed for each general task. Each subtask statement delineated specific products or services which were to be produced or delivered. The relating of subtasks to Project phases led to the development of time-lines, or milestone charts, to assure the production or delivery of products and services to meet the contractual requirements of the STD.

Personnel performances were related to subtask statements by descriptions of staff activities in producing or providing services and products. This process enabled Administration and function component management personnel to group activities and methodologies for each personnel position, to develop position descriptions, to identify areas of functional component overlapping in performing certain tasks, to estimate the number of work-days required to perform tasks, and to prepare man-loading charts and budget requirements. The latter outcome tied the Task Organization management system to the Budget Control system.

The task design freedom given to personnel was conducive to meeting their needs for relative autonomy in choosing how to best utilize their talents to meet task requirements.

The overall outcome of these activities was the development of statements concerning the total Project's tasks, subtasks, activities, schedules, and time-lines.

The identification of tasks dependent upon the efforts of two or more functional components was an important outcome of these activities. A PERT system was used to identify the impact of task interrelationships on the overall Project schedule. An example of the worth of this system was the revelation that Utilization would have to initiate the site selection effort much earlier than originally anticipated because Broadcast and Engineering required detailed site location information in order to apply to the Federal Communications Commission for frequency clearance.

In summary, the Task Organization management system enabled personnel to understand better the overall Project requirements and how their efforts related to the attainment of the STD's mission.

Administration scheduled weekly management meetings to facilitate feedback concerning functional areas' objectives, tasks, and activities. The reports generated from the Task Organization system were merged with the Budget Control system to assure that the Project's activities were appropriate and within budget limitations.

THE BUDGET CONTROL MANAGEMENT SYSTEM

The purposes of the Budget Control Management System were to:

(1) provide for budget development;

(2) manage funding negotiations; and

(3) assure cost and budget control.

A set of budget accounts was developed around the unique needs of the Project. The budget account codes specified the summative level of the accounting system. The criteria used to develop the chart of accounts were the:

(1) volume of budgeted expenditures within a proposed account code;

(2) volatility from month to month within a proposed account code; and

(3) required amount of budget data support and justification required for specific account expenditure codes.

The chart of accounts and budget control systems were designed to be used by Project personnel within the functional areas who were not trained in financial accounting. For this reason, simplicity of design and personnel understanding were key considerations. The initially designed chart of accounts was modified during the life of the Project as new expenditure code needs were identified and as new tasks were added to the STD's mission through negotiation with funding agencies.

Budget development was a key management task. The development of the budget was initiated at the functional component level to capture the most accurate and specific estimates of need. The functions' budget need specifications consisted of: (1) the specific number of personnel days required to accomplish targeted tasks; and (2) the required number of consultant days, equipment, and other task support needs such as printing, contract labor, and travel. These functional component estimates of budget need were reviewed by Administration, meeting with functional component directors. These meetings produced detailed analyses of: (1) planned level of detail and task quality to be attained; (2) opportunities for merging similar activities or expenditure codes not previously identified; and (3) trade-off possibilities between and among functional components' budget requests. (See Figure 2.)

PROJECT FUNDING

The life and operation of the STD depended upon funding negotiations with federal agencies. These negotiations were approached by Project administration and the functional component directors in a rational manner, corresponding to the STD's strategy of relating budget needs to Project objectives and required tasks necessary to attain objectives. In this manner, any proposed modifications of STD budget requests could be related to resultant modifications of the Project's mission and to the products and services to be delivered. This process enabled both STD and funding agency officials to estimate quickly the consequences of budget modifications on product and service outcomes. Subsequent to funding negotiations, additions and deletions were made if necessary to the functional components' statements of task, subtasks, and activities.

EXPENDITURE CONTROL AND REPORTING SYSTEMS

Because the Project was of a short-term nature with specific objectives and well-defined budget resources, it was important to establish expenditure control and reporting systems. The purposes of these systems were to:

(1) keep Project expenditures within the allowable limits of budget resources;

(2) give assurance that expenditures were appropriate to the Project's purposes;

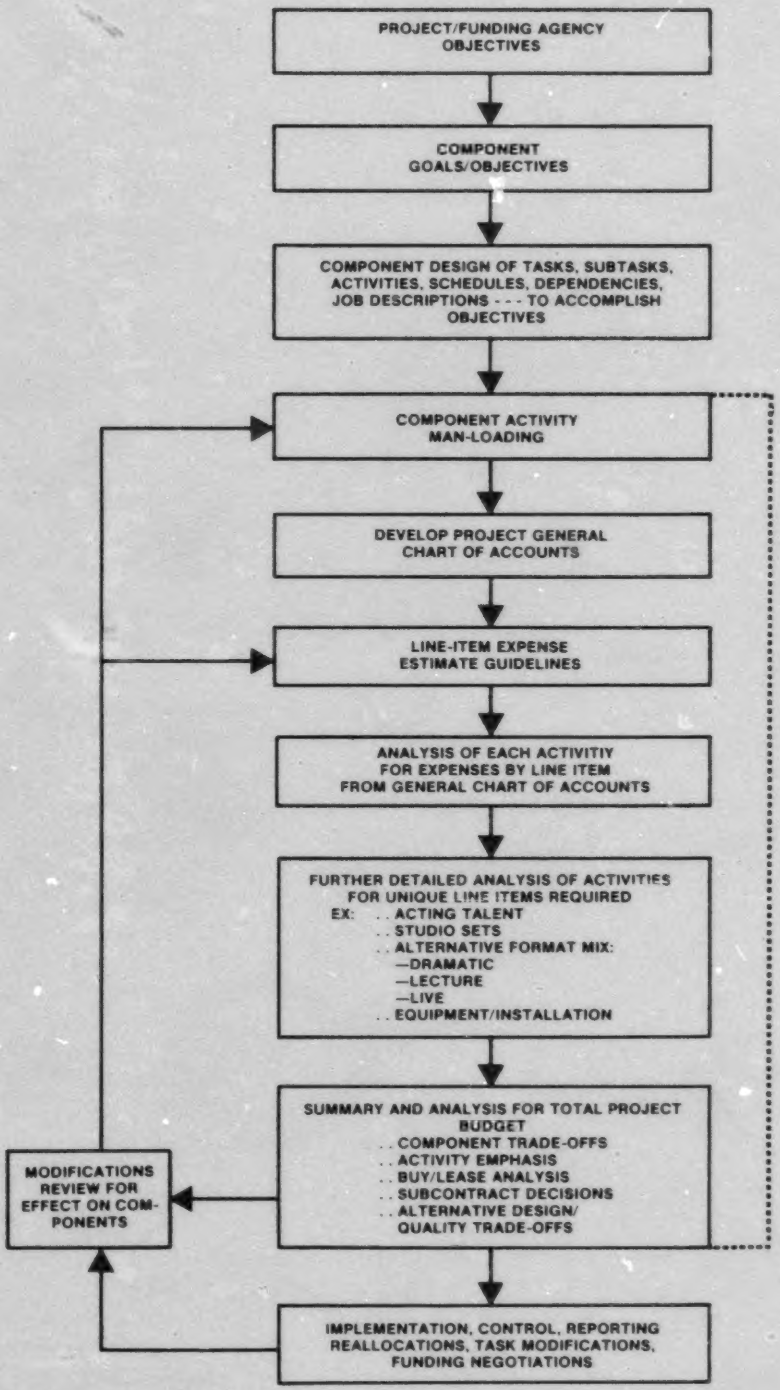

PROJECT/FUNDING AGENCY OBJECTIVES
COMPONENT GOALS/OBJECTIVES
COMPONENT DESIGN OF TASKS, SUBTASKS, ACTIVITIES, SCHEDULES, DEPENDENCIES, JOB DESCRIPTIONS - - - TO ACCOMPLISH OBJECTIVES
COMPONENT ACTIVITY MAN-LOADING
DEVELOP PROJECT GENERAL CHART OF ACCOUNTS
LINE-ITEM EXPENSE ESTIMATE GUIDELINES
ANALYSIS OF EACH ACTIVITIY FOR EXPENSES BY LINE ITEM FROM GENERAL CHART OF ACCOUNTS
FURTHER DETAILED ANALYSIS OF ACTIVITIES FOR UNIQUE LINE ITEMS REQUIRED
EX: . . ACTING TALENT
. . STUDIO SETS
. . ALTERNATIVE FORMAT MIX:
—DRAMATIC
—LECTURE
—LIVE
. . EQUIPMENT/INSTALLATION
SUMMARY AND ANALYSIS FOR TOTAL PROJECT BUDGET
. . COMPONENT TRADE-OFFS
. . ACTIVITY EMPHASIS
. . BUY/LEASE ANALYSIS
. . SUBCONTRACT DECISIONS
. . ALTERNATIVE DESIGN/ QUALITY TRADE-OFFS
MODIFICATIONS REVIEW FOR EFFECT ON COMPONENTS
IMPLEMENTATION, CONTROL, REPORTING REALLOCATIONS, TASK MODIFICATIONS, FUNDING NEGOTIATIONS

FIGURE 2
BUDGET DEVELOPMENT

(3) develop and maintain functional component directors' active involvement in budget control and reporting; and

(4) anticipate future budgetary problems in time to develop adequate responses and management of the problems.

Administration recognized at the outset that budgets were approximations or best estimates of expenditure requirements to attain objectives. A consistent and comprehensive review of actual expenditures and encumbrances versus Project budget allocations was necessary to assure Project stability. It was assumed that budget reallocations would occur as a result of unanticipated needs or cost increases over original estimates. While these assumptions were made at the outset, Administration assumed that stability and effectiveness could be maintained only through a continuous and careful analysis and review of any proposed changes.

Budget allocations could be quickly modified as necessary. Expenditures for travel, consultants, telephone and communication services, and legal expenses were monitored closely. Deviations from budgeted allocations of five percent or more required immediate analysis, reporting, and reallocation.

Both formal and informal feedback techniques were used in the Budget Control and Reporting Systems. Administration pursued a conscious policy of discussing problems with appropriate STD personnel at all levels. While these discussions were random and informal, there was a clear understanding that no decisions would be effected until there were more formalized meetings with all component personnel affected by the decision. The intent of this practice was to assure all personnel that Administration was keenly interested in the Project's development and that staff would be quickly and easily involved in problem-solving. Administrative follow-through was required to see that problems identified were managed effectively and that the decisions made were acceptable. These techniques assured Project personnel that their perceptions, ideas, concerns, and talents were of value in the decision-making process.

The formal reporting system consisted of several scheduled reports and meetings:

Report/Meeting	**Frequency**
Management Report	Weekly
Task Status Report	Bi-Monthly
Budget Exception Report	Monthly
Project Status Report for NIE	Bi-Monthly
Budget Review Meeting	Monthly
Management Meeting	Weekly

This reporting schedule was fully implemented in July, 1973. Previously, reporting and related meetings had focused on the task: subtask:activity network described in a prior section of this report and initiated in the fall, 1972.

During periods of stable operation, reports and meetings were required less frequently than scheduled. However, budget control and review were maintained consistently to assure Project stability. During times of transition from one Project phase to another, formal reports and meetings were required frequently. Fortunately, phases occurred at different times within different functions, which enabled Administration to deal with one function at a time.

The "Management Report," which was initiated in October, 1973, was designed to serve Administration's and the functional component directors' needs for: (1) identifying problems; (2) giving and receiving information and identifying decision-making needs; and (3) expressing concerns about the Project and its operations. The general format for the "Management Report" consisted of four areas: (1) schedule; (2) budget; (3) personnel; and (4) component interface. Directors were provided the following guidelines, prepared by Administration, to prepare the weekly report:

General Information:	Administration will consider the 'Management Report' as an opportunity for Directors to formally notify the Administration and other Directors of a need for decisions, resources, anticipated or current problems, and status of activities. The need for this report will be reassessed at a later date when the project becomes operational.
Schedule:	A general statement of the component's adherence to the milestone schedule, including an identification of primary activities behind schedule which may cause delays with an explanation of actions taken or planned to alleviate the problem.
Budget:	A statement of any known and major budget overages. (Five percent or more from budget allocations.)
Personnel:	A statement of concerns relating to any personnel problems, including such matters as a lack of personnel, personality problems that are unresolved, benefit concerns, facility conditions, etc.
Interface:	Any problems or unresolved problems relating to inter-component activities.

The Task Status Reports were in effect summaries of relevant data and information revealed in the Management Report. Directors were required to report for each task and subtask the following information:

(1) potential opportunities and unanticipated problems;

(2) action alternatives or solutions for problems and component interface requirements; and

(3) documentation required for planned decisions.

Budget Reports were prepared by each Director. These reports documented any variance in expenditures or encumbrances exceeding five percent or more of the budget allocation. Budget requirement variances required a Director to respond to the following questions:

If the variance was below budget allocation:

1. Can the unused budget allocation be considered as available funds for other needs?
2. Will the unused budget allocation be needed in the future for its originally intended purpose?
3. Will the deviation from the budget allocation continue throughout the year?

If the variance was above budget allocation:

1. Will the variance continue? For how long? In the same amount?
2. Will you need more budget funds for this need? How much?
3. Can you justify the variance? Why has the variance from budget allocation occurred?
4. Are other budgeted allocations for line items likely to be exceeded? What are the line items, your cost projections, and anticipated deviations from budget allocations and reasons for the deviation?

The applications of the budget review process over a period of time acquainted the Directors and Administration with the total budget and expenditure levels. Component budgets were refined and revised as expenditure feedback provided current information vital to the Project's operation. Variances above original estimates were managed by reallocating funds from available underexpended line items such as travel, consultants, and personnel. In some cases, the adjustment could be made only by terminating personnel at a date earlier than originally anticipated.

The formal reporting and review systems described above provided for the integration of task and budget control systems to provide timely and accurate information for decision-making. The flexibility of the reporting systems and the focus on outcomes and related performance activities helped to prevent the generation of meaningless and distorted feedback.

COMMUNICATIONS NETWORK

Throughout the Planning phase of the Project, technical functions included identifying remote sites, clarifying production plans, surveying regional transmission facilities, identifying uplink alternatives, and planning the hardware configuration.

The preliminary design of the ground support system was completed in June, 1972; in October, 1972, the Federation submitted a proposal to the Office of Telecommunications, Office of the Secretary, DHEW, for the Development and Operation phases of the Demonstration. The proposal was funded on December 22, 1972, as a separate contract. The work statement included:

(1) providing staff support for contracts personnel in the Office of the Secretary, DHEW, for procuring the ground equipment;

(2) discharging responsibility for installing, integrating, and maintaining the HET ground systems; and

(3) serving as Operations Manager, under NASA supervision, of the HET ground segment during pre- and post-launch phases of the ATS-6/HET Experiments.

For a period of nine months, the STD delivered signals to 69 terminals (52 at remote STD sites, 4 at certain cable and translator systems which served 4 additional remote sites, 12 at public broadcasting stations, and 1 at the University of Nevada at Las Vegas for redistribution) in the Rocky Mountain region via the ATS-6 and the ATS-3. The STD was designated to serve as Operations Manager for the HET ground network, which included all six HET Experimenters. To meet this responsibility, the Network Coordination Center in Denver was used to link the users of terrestrial equipment to the satellite operations center. Along with multi-signal routing, switching, monitoring, and redundancy systems, special links were established with remote terminals, program origination centers, and NASA's Applications Technology Satellite Operating Control Center (ATSOCC) in Greenbelt, Maryland.

The major ground segment elements of the HET consisted of ATSOCC at the Goddard Space Flight Center; NASA earth stations in Rosman, North Carolina, and Mojave, California; an STD earth station near Morrison, Colorado; the HET Network Coordination Center (NCC) operated by the STD in Denver, Colorado; regional control centers in Lexington, Kentucky, Fairbanks, Alaska, and Seattle, Washington; and 119 remote terminals. The network has been discussed in terms of two separately engineered systems, each having a space and ground segment.

SYSTEM DESCRIPTION

ATS-6/VIDEO COMMUNICATIONS

SPACE SEGMENT

The ATS-6 was equipped with a spot-beam antenna and a global-beam antenna. Special switching capabilities of the spacecraft supplied usable signals from C- or S-band frequencies. The satellite could receive video transmissions at 6 GHz or 2.25 GHz and could transmit simultaneously a video signal at 4 GHz and at two S-band frequencies in the 2.5 GHz band. This flexibility enabled the NCC in Denver to monitor all transmissions and to coordinate the unique distribution needs of each Experimenter while operating within the rules and regulations established by the Federal Communications Commission.

Most of the HET network experiments were designed to make use of the comparatively high-power signal transmitted by the ATS-6. With its 9.15-meter (30-foot) diameter parabola and 15 Watts (minimum at end of life) of **rf** power at 2.6 GHz, the Effective Isotropic Radiated Power (EIRP) was 48 dBW at beam edge, thus providing reception of high-quality color video signals at terminals with modest system sensitivities. The range of figure of merit (G/T) provided Television Allocation Study Organization (TASO) 1 or better picture quality.

GROUND SEGMENT

The Broadcast and Engineering component of the STD assisted in writing the specifications for the terminals in the ground segment system. They also installed and maintained: (1) the 2.5 GHz Receive-Only Terminals designed to receive and demodulate a single video signal and four associated audio channels; (2) the high-powered Denver Uplink Terminal (DUT), also called the Morrison Earth Station, for transmitting and receiving all satellite signals; (3) a 12.5 GHz microwave relay for transmitting and receiving signals between Morrison and NCC; and (4) the Network Coordination Center (NCC) in Denver.

The Receive-Only Terminal (ROT) consisted of a 10-foot parabolic antenna, a microwave preamplifier, and an indoor demodulator. The composite spectrum of the audio subcarriers and the video signals were transmitted via wideband FM on either of two **rf** channels whose carrier frequencies were centered at 2566.7 MHz and 2667.5 MHz. (The peak-to-peak deviation of the **rf** carrier was 16.5 MHz.) The ROT acted as a converter which transformed the signals from FM into a standard baseband format for display on a color television receiver, with a maximum of four simultaneous audio program channels available.

To interface with the global beam of the ATS-6, the uplink earth station at Morrison operated at 4 GHz (downlink) and 6 GHz (uplink). The station used a 3 kW transmitter, an uncooled parametric amplifier which provided a low-noise system, and an 11-meter (36-foot) prime focus parabolic antenna. Changes in the pointing coordinates necessitated by the movement of the ATS-6 were accomplished by the operator; predicts of the required elevation and azimuth at the uplink were generated by the Network Coordination Center using orbital elements provided by NASA.

The 12.5 GHz microwave relay interconnected the Network Coordination Center with the 4/6 GHz earth station. The signal from the NCC to the earth station was transmitted at 12.240 GHz, and the return signal from the earth station to the NCC was transmitted at 12.500 GHz. Thirty MHz channels were used in each case. The DUT was situated near Morrison, Colorado, in a valley which provided natural shielding from other users in Metropolitan Denver who shared the frequency spectrum. The microwave relay transmitted line-of-sight to a tower mounted at the top of a hill northeast of the earth station and southwest of the NCC. Two antennas, mounted and installed back-to-back in a passive format, provided microwave transmissions to and from NCC and DUT.

ATS-3/VHF COMMUNICATIONS, SPACE AND GROUND SEGMENTS

In addition to ATS-6 television transmissions, the ATS-3 was used to augment capabilities at 24 of the STD sites by providing the means for two-way VHF voice communications. The major elements of the VHF ground system at a remote site included a helical antenna used for simultaneous transmission and reception, a diplexer, a preamplifier, and a VHF communications console which contained the transmitter-receiver and digital coordinator. The console was developed with unique capabilities for experimental purposes. For example, the digital coordinator was designed to act as the complete control device for all the VHF equipment, including the transmitter-receiver and a two-way data capability, both tested with selected sites toward the end of the Demonstration.

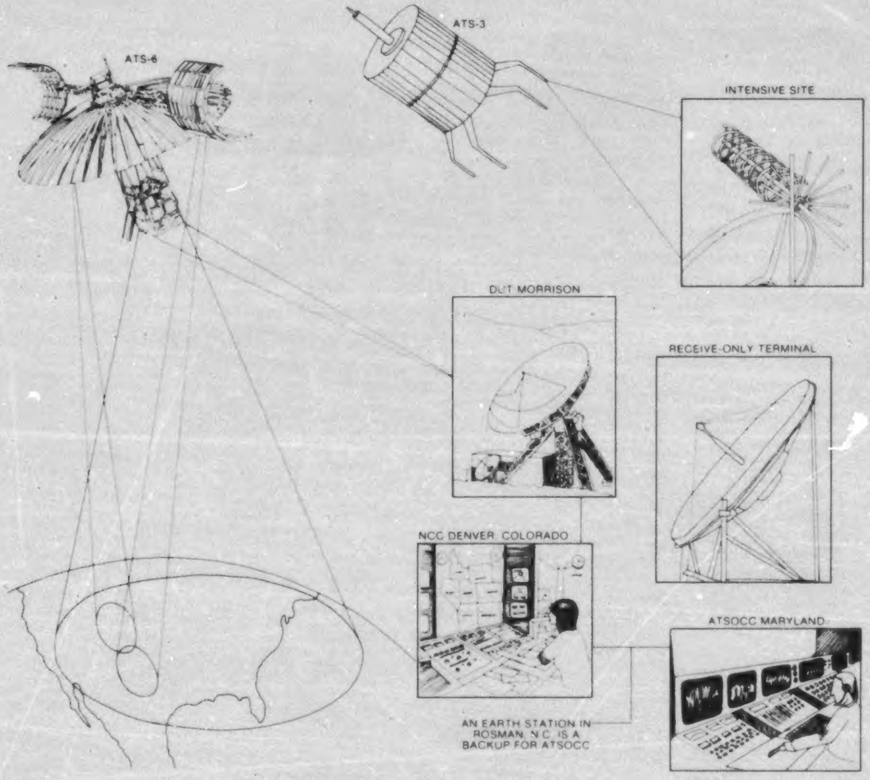
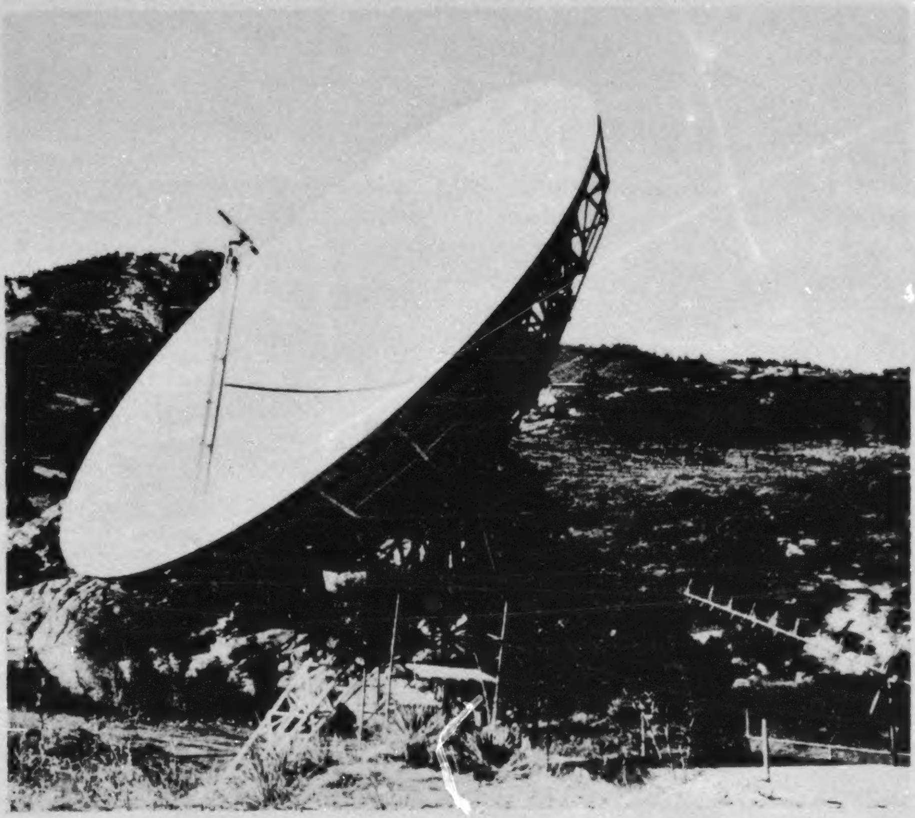


FIGURE 3
HET COMMUNICATIONS NETWORK

VHF equipment at the Morrison Earth Station included a master controller to permit computer control of the Morrison VHF equipment, a single 300-Watt VHF transmitter used for all VHF voice and data traffic outgoing from NCC, and three VHF receivers used for monitoring incoming signals. Two of the receivers were equipped with phase-locked loops for reception of data from the remote sites. A dedicated phone link interconnected the three VHF receivers with the NCC.



OPERATIONAL SYSTEM

REMOTE INSTALLATION

2.5 GHz RECEIVE-ONLY TERMINALS

The transponders NASA had included on the ATS-6 spacecraft in support of the HET Experiments were designed to supply enough transmitted power to permit direct reception of high-quality wideband frequency-modulated signals at comparatively small earth stations. Therefore, a systems requirement by NASA for a minimum 49 dB peak-to-peak video-to-weighted **rms** noise ratio was set as the signal standard. As the development of the ATS-6 progressed, HET systems engineers became concerned about the likelihood of any vendor designing an antenna (7-foot) efficient enough to receive a usable signal from the spacecraft. Therefore, the performance requirements for the small terminals were significantly increased. This requirement translated into specifications for a three-meter parabolic reflector and a low-noise preamplifier front end instead of a passive front end. Indeed, such equipment was necessary for satisfactory operation at beam edge, although a smaller antenna diameter could have been used at sites within the satellite antenna pattern. The link parameters have been summarized in Table 1. In the interest of standardizing equipment, simplifying procurements, and minimizing costs, identical stations were supplied to all sites. (Roundup, Montana, was the only exception. Because Roundup was very near beam center, an experimental 2-m antenna was installed there.)

TABLE 1

Communications Systems Parameters

ELEMENT	CALCULATED	MEASURED/USED
SATELLITE EIRP (FOV)	47.9 dBW	49
PATH LOSS AT 2.5 GHz	192.6 dB	192.6
POINTING ERROR LOSSES		
A. SPACECRAFT	.5 dB	0.5
B. GROUND RECEIVER	1.0 dB	0.5
MISC. LOSSES	0.5 dB	0.5
SYSTEM NOISE BANDWIDTH = 25 MHz	74 dB-Hz	74
SYSTEM G/T	7.1 dB/°K	8.0 dB/°K
DOWNLINK CARRIER-TO-NOISE RATIO	15.0 dB	17.5 dB
UPLINK CNR	23.0 dB	23.0 dB
RESULTANT RECEIVED CNR	14.4 dB	16.4 dB
DEVIATION INDEX	2.38	1.96
FM IMPROVEMENT, dB	17.0 dB	16.4 dB
PRE-EMPHASIS IMPROVEMENT	2.4 dB	2.4
NOISE-WEIGHTING FACTOR (CCIR)	10.2 dB	10.2
PEAK-TO-PEAK VIDEO CONVERSION FACTOR	6.0 dB	6.0
PEAK-TO-PEAK VIDEO SIGNAL TO RMS NOISE RATIO	50.0	51.4
LESS IMPLEMENTATION LOSS	--	1 dB
NET SNR		50.4 dB

Parabolic Reflector

The Receive-Only Terminal (ROT) consisted of a 3.05-meter (10-foot) segmented parabolic antenna, an antenna-mounted low-noise transistor preamplifier, and an indoor demodulator unit. The system was supplied by the Westinghouse Corporation under a competitive procurement managed by DHEW, with assistance from NASA and FRMS. The antenna and feed were built by Prodelin Company of Heightstown, New Jersey, and the receiving system was built by the Hewlett Packard Company of Palo Alto, California.

The reflector, made from fiberglass, came in four quadrants with a central hub which supported the prime focus feed. The radiating element of the prime focus feed was a right-hand circular helix. The downlink transmissions from ATS-6 were left-hand circularly polarized. The measured efficiency of the antenna at 2500 MHz was 53 percent, thus providing a gain of just over 35 dB.

The segmented antenna design was employed to facilitate shipping to remote areas, especially Alaska. After several design changes during the initial manufacturing process, a satisfactory technique was perfected which permitted proper alignment of the petals and easy assembly without cracking the fiberglass.

The positioning system which held the reflector was designed to mount on a pair of large timbers which in turn were secured either to the ground or to the substructure of a roof. The mount had an azimuth adjustment range of ±20° and an elevation range from 0 to 70°. The limited range of the azimuth positioning required very careful initial location of the timbers or substructure with respect to the antenna pointing coordinates. In initial orbital position, the axis of the ATS-6 spacecraft was inclined 2°. The 3-dB beamwidth of the 3-meter (10-foot) antenna was only 2.7° and consequently, it was necessary to repoint the antenna daily to accommodate morning, afternoon, and evening programming. However, because of the relative position of the ground receiving terminals in relation to the satellite, the only adjustment necessary was in elevation. To expedite the elevation adjustment, 89 of the terminals were retrofitted with a motorized remote control system. (It was fortunate that few adjustments in azimuth were required, because this adjustment mechanism was inconvenient to use.)

The Hewlett Packard Receiver

The Hewlett Packard receiver accepted a wideband FM signal at either of two frequencies centered at 2566.7 or 2667.5 MHz and provided a National Television Systems Committee (NTSC) standard video output signal at baseband suitable for driving television monitors. The receiver also provided four audio channels, transmitted as subcarriers on the frequencies, from 4.64 MHz to 5.36 MHz. Early in the development of the Hewlett Packard receiver, a decision was made not to remodulate the video signal onto a standard television channel because it would cost considerably more to provide a high-quality modulator that could cover all of the VHF (2-13) television channels.

The Hewlett Packard receiver differed from ordinary microwave video receivers in two important respects: It used a fast, automatic gain control (AGC) loop instead of a limiter and demodulated the signal at the received frequency rather than at an intermediate frequency. The fast AGC loop used a PIN-diode attenuator network which provided up to 40 dB of amplitude-modulation (AM) suppression over a 40 MHz bandwidth. The disadvantage of this type of AM suppression system was that the dynamic threshold (although under 11 dB) was sensitive to the peak-to-peak deviation of the video signal.

The video signal was demodulated directly at **rf** using a transmission line discriminator of a balanced and compensated design. The bandwidth of the discriminator covered the entire allocation from 2500 to 2690 MHz. The desired channel was selected by a 23.5 MHz bandpass filter centered at the desired channel frequency. Because the programming transmissions operated on fixed-channel assignments throughout the Experiment, there was never a need to change the easily replaceable filters.

This direct demodulation approach was selected by Hewlett Packard to eliminate the need for a local oscillator and to make use of economical **rf**-gain-stages. This approach was feasible as there were only two channels available for broadcasting, and changes from one channel to another were neither expected nor required.

Since the receiver was a "tuned radio frequency" receiver, all the gain was at 2500 MHz. (This type of receiver dates back to the very early days of radio and is popularly known as a "tuned radio frequency" or "TRF" receiver.) The low-noise preamplifier at the antenna provided 55 dB gain at a noise figure of under 4 dB and the remainder of the 130 dB of gain was obtained at the indoor unit. A 3/4"-diameter, low-loss, foam-filled cable was used to bring the signal from the antenna unit to the indoor unit; it was guaranteed to have fewer than 9 dB loss for a 100-foot length.

The final specifications for receiver performance represented a compromise between studio-quality and home-receiver-quality video. This compromise was made because in over 90 percent of the installations, the received video signal was used directly at that location and was not rebroadcast. Therefore, no additional degradation occurred. Only the participating public broadcast stations had the capability to detect degradation from studio quality, if any occurred.

VHF Transmitter - Receiver Terminals

Twenty-four of the STD remote sites were equipped with VHF transmitter-receiver systems used in conjunction with the ATS-1 and ATS-3 spacecraft, which enabled "live" voice interaction between the various HET coordination centers and the sites, and among the sites themselves. Additional requirements for the HET system included teletype capability and the STD's experiment with the digital system.

The VHF terminal consisted of a specially modified General Electric 90-Watt transmitter-receiver, a helical antenna which was used for simultaneous transmission and reception, a diplexer, a low-noise preamplifier, and a digital coordinator. The transmitter-receiver and the digital coordinator were housed in a cabinet on casters with a desk top. The antenna configuration was chosen because it provided the necessary circular polarization with no installation or operator adjustments. A transportable design was developed, permitting easy erection of the equipment in the field. The diplexer filter and preamplifier were commercially available subsystems.

The digital coordinator was the device which performed all control functions for the VHF equipment, sending and receiving digitally coded commands to and from the sites to Denver. To simplify its use, the coordinator was designed to act as the complete control device for all the equipment, and also to serve as the control panel for the VHF transmitter-receiver.

To conform with requirements placed on the HET Experiments by the Interagency Radio Advisory Committee, the VHF terminal had to operate in a half-duplex mode; that is, there had to be an open receive channel at the remote site even as the sites were transmitting. Only in this manner was it possible to terminate transmissions from a remote site upon a command from NASA or NCC in case of emergency or unauthorized transmissions.

Each station was assigned a unique address number, digitally coded. This address was to be transmitted in a five-word preamble each time the site transmitter was keyed on, thus providing positive identification for all terminals at the NCC. Transmissions to remote sites from the NCC were also to be preceded by the same type of digital preamble. This enabled selective control by NCC of the terminal functions at any particular site. The preamble and all data transmissions (except teletype) were to be sent in the ASCII format (a start bit, 7 bits of data, parity, and 2 stop bits) asynchronously at 1200 bits per second. This rate was chosen to permit the substitution of a standard phone link in the event that the ATS-1 or ATS-3 spacecraft failed during the course of the Experiment. The five words in the preamble consisted of a start word, an address, a status or command word (depending on whether it was to be transmitted from a remote site or from the NCC), a repeat of the third word as a redundant check, and an end word. The coordinator converted this serial data stream automatically for transmission over the link to a parallel format for processing, using integrated circuits. The transmissions to the NCC were phase-shift-keyed for increased protection from errors on the link, but all transmissions from NCC to remote sites were frequency-shift-keyed. This was done because the Denver transmitter had a 300-Watt capability and therefore, all other things being equal, the signal-to-noise ratio was higher at remote sites than at NCC.

The basic General Electric receiver needed only minor modifications to detect data transmissions. The receiver's digital coordinator had three main functional circuits: (1) receive and decode logic; (2) encode and transmit logic; and (3) command-control logic. There were to be four modes of operation: CALL, VOICE, DATA, and AUTOMATIC DATA. In the

CALL mode, the remote operator would indicate on the spacecraft order wire (Channel 2) by digital transmission only, a desire to establish contact with NCC. In the VOICE mode, normal two-way communications took place on spacecraft Channel 4 in the lower 48 states and on Channel 3 in Alaska. In the DATA mode, teletype transmissions were transmitted from a site to any other site similarly equipped. In the AUTOMATIC DATA mode, the NCC operator could collect data from peripheral (digital) devices directly, without any remote operator assistance. In addition, the NCC could transmit up to 20 separate commands to perform such tasks as the automatic shutoff of equipment in the event of an unauthorized transmission or a network emergency, or the activation of other, peripheral equipment via dry-contact closures on internal relays. This feature, which was not used operationally, permitted the use of videotape recorders at unattended sites to record early morning transmissions for later playback.

SITE EQUIPMENT OPERATOR

Remote site operators were selected with no prerequisite background in broadcasting and engineering. During the developmental stages of the Demonstration, the necessary background and capabilities of the site operators were based on the Program, Utilization, and Research needs of the Project. Indeed, a survey of their interests and capabilities at the onset of the Project showed little or no inclination for communications equipment. Although the problem of training people was not necessarily formidable, it was complex and unique. A detailed study of the factors involved in training site operators was undertaken.

Site Operator Profile

The results from the Site Operator Profile survey have been provided in the section, "Results and Conclusions." However, to understand the training required, general comments about the background of the site operators are appropriate.

Prior to their STD experiences, a sizable percentage of the individuals surveyed indicated special interest, training, and capability relative to some familiar types of technological equipment; but an equally sizable percentage indicated no special interest, training, or capabilities in communications equipment. Actually, STD site equipment operators were paid token fees and are best described as having been motivated by the service benefits of the system.

Site Operator Training

In November, 1973, the engineering staff developed a **Simulation and Pre-Launch Test Plan** for operations. In January, 1974, it was successfully prototyped and was further modified as the various inter- and intra-HET project changes occurred. A systems specifications document, the **Broadcast and Engineering Training Manual for HET Network Site Operators,** was produced in June, 1974. From time to time, minimal revisions and updates dealing with details of network operations were issued.

The following excerpt from the "Introduction" to the **Training Manual** (Broadcast and Engineering, pages 1 and 2) summarizes the tasks performed by the site operators:

> This Manual is written from the Broadcast and Engineering perspective. Its aim is to train the site operator in four areas: (1) description, use, and care of the STD equipment; (2) protocol procedures, including contingency actions in malfunction situations, and reporting procedures for equipment failures; (3) standard tests, checks, and measurements to be performed; and (4) broadcast schedules.
>
> Section II provides an explanation of the unique communication system being implemented in the Demonstration, including particular communications capabilities of the participating remote sites. It proceeds from a general account of the communications network to more detailed descriptions of those areas with which the site operator will be most concerned.
>
> Section III contains prescribed standards to be maintained throughout the project. Included are the guides outlining ROT and IT operational procedures, station call letters, standards to be adhered to in using the voice transmit function of the VHF Transmitter-Receiver system, failure reporting procedures, and contingency actions.
>
> Section IV describes data to be gathered and includes an explanation of the standardized computer forms that will be used for recording information. The accuracy that is needed for these data related tasks cannot be overemphasized.
>
> Section V discusses the broadcast schedule guide that will be mailed periodically and outlines pre- and post-program events.

The original procedure for training consisted of a three-tiered plan in which (1) Project engineering personnel trained and tested regional-level field service personnel who (2) then trained and tested state-level field service personnel who (3) in turn, trained and tested the local site operators.

In practice, the plan was modified by omitting the first phase. Instead, Project engineering staff directly trained and tested the state coordinators in the second phase. One week was allowed for trainees to read the Manual, followed by a two-day session at the regional offices in Denver. The first day was an eight-hour intensive training session, including necessary equipment demonstrations. The second day consisted of a four-hour question and explanation period, followed by a written examination. In the summer months of 1974, state coordinators had the opportunity to demonstrate operational competency during a series of pre-operational checkout events.

The final phase, training site operators, was, for the most part, done by the state coordinators. Financial constraints, limited time, and the late hiring of site personnel were factors which led to the plan's implementation differing from its design. For these reasons, a 20-minute presentation by the engineering staff, including a six-minute demonstration film, was transmitted via the satellite network during a three-day pre-service training and orientation period covering all aspects of the Project. The regional presentations were transmitted to site operators and their respective state coordinators who were clustered at eight locations within the region. A constraint on this presentation was that few, if any, of these people had the Manual prior to this pre-service session which was held at the end of August, 1974.

The written examination, designed to test for initial evidence of competency, was given in some instances immediately following the pre-service sessions. In other cases, it was administered at a later date. There were also cases in which the instrument was used as a learning reinforcement device.

Site Operator Performance.

For the operational phase, the STD developed a site status reporting system to record, analyze, and account for all remote site equipment information as it was received. The nature of that system made it possible to deduce the adequacy of site operator performance.

Five sources provided the information for this site status reporting system:

1. The Network Coordination Center had a special direct-dial telephone which was used to provide the most recent and up-to-date information about existing conditions at an installation and enabled equipment repairs to be made as rapidly as possible.
2. Computer-coded information, compiled on OMR (Optical Mark Read) cards, provided periodic data for cumulative analyses and for comparisons between sites, as well as for individual site diagnosis when problems occurred.
3. The Maintenance and Repair Team Supervisor was the source for repair reports.
4. Field Service weekly reports provided information at times.
5. Research site status reports frequently provided information not previously known.

It was hypothesized initially that the first three sources would be sufficient for all reporting needs. Subsequently, however, the last two sources provided information which had not been routed through specified channels.

The following tables and figures from the **Broadcast and Engineering Training Manual for HET Site Operators** were developed to give the site operators information and standards to be used in filling out the Optical Mark Read (OMR) Cards for computer analysis.

HP RECEIVER SIGNAL STRENGTH METER

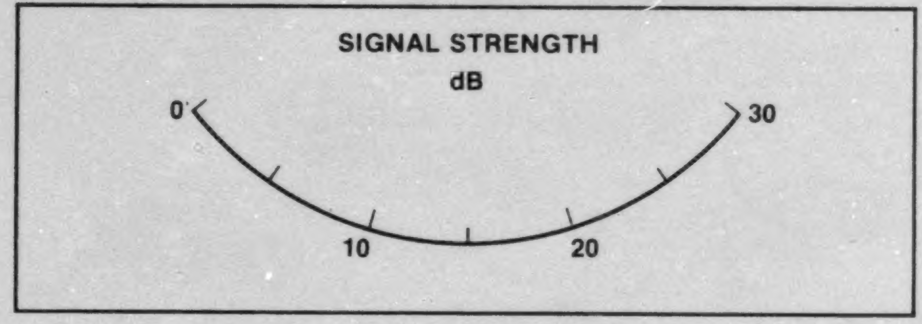


FIGURE 4 ATS-6 SIGNAL STRENGTH CHECK

The HP Receiver Signal Strength Meter has increments of 5 clearly marked. As measurements will be recorded in increments of one, from 0 to 30 dB, readings between 0 and 5, 5 and 10,etc., must be estimated as accurately as possible. Readings will be recorded on Part A, Site Status Report, in the section titled "HP Recv. Signal Strength Read."

TABLE 2

Weather Check

Weather checks at site locations will be made using the following standard descriptors and temperature range notation. Information will be recorded on Part A of the Site Status Report.

1) Below -50°*
2) -25° to -50°
3) -25° to 0°
4) 0° to 30°
5) 31° to 50°
6) 51° to 80°
7) 81° to 90°
8) 91° to 100°
9) 101° to 115°
10) Over 115°

CLOUDS:	(1) Little/none	(2) Moderate	(3) Heavy
WIND:	(1) Little/none	(2) Moderate	(3) Heavy
RAIN:	(1) Little/none	(2) Moderate	(3) Heavy
SNOW:	(1) Little/none	(2) Moderate	(3) Heavy
ICE:	(1) Little/none	(2) Moderate	(3) Heavy

*Temperatures are given in degrees Farenheit.

TABLE 3A

Intelligibility Comment Systems Audio

The following Audio Comment Reporting System provides the operator with standard descriptors that indicate (1) the clarity of the message, i.e., Readability; and (2) the strength of the signal, i.e., Signal Strength. The system will be used to report the status of either ATS-3 or ATS-6 audio signals.

AUDIO SIGNAL RECEPTION COMMENT SYSTEM

READABILITY

1 - UNREADABLE.
2 - READABLE WITH DIFFICULTY.
3 - READABLE WITH PRACTICALLY NO DIFFICULTY, OR NO DIFFICULTY.

SIGNAL STRENGTH

1 - FAINT SIGNALS OR VERY WEAK SIGNALS.
2 - FAIR SIGNALS.
3 - GOOD SIGNALS OR VERY GOOD SIGNALS.

The following table defines "no go" audio comments which constitute an Inoperative Terminal. The system will be used to describe either ATS-3 or ATS-6 audio signals.

READABILITY

Signal Strength	1	2	3
1	NO GO	NO GO	--- (NOT APPLICABLE)
2	NO GO	GO	GO
3	NO GO	GO	GO

A "no go" audio signal, i.e., an Inoperative Terminal, will be reported using a *Readability by Signal Strength* comment, using the appropriate digit descriptors. For example, a report of a "no go audio signal at 1 by 2" is a report of a situation in which the signal is "unreadable" and "fair signals." Correct sequence is most important. Always give Readability first, and Signal Strength last.

TABLE 3B

Intelligibility Comments Systems Video

The following Video Comment Reporting System provides the operator with standard descriptors that indicate the perceptibility and objectionableness of the distortion and/or noise.

VIDEO SIGNAL RECEPTION COMMENT SYSTEM

DISTORTION AND/OR NOISE PERCEPTIBILITY

1 - PICTURE CONTENT IMPOSSIBLE TO ASCERTAIN.
2 - VERY PERCEPTIBLE DISTORTION AND/OR NOISE BUT PICTURE CONTENT ASCERTAINABLE.
3 - DEFINITELY PERCEPTIBLE DISTORTION AND/OR NOISE.
4 - BARELY PERCEPTIBLE DISTORTION AND/OR NOISE.
5 - IMPERCEPTIBLE.

DISTORTION AND/OR NOISE OBJECTIONABLENESS

1 - EXTREMELY ANNOYING.
2 - VERY ANNOYING.
3 - DEFINITELY ANNOYING.
4 - SLIGHTLY ANNOYING.
5 - NOT ANNOYING.

The following table defines "no go" video comments which constitute an Inoperative Terminal. The system will be used to describe ATS-6 video signals.

PERCEPTIBILITY

Objection-ableness		1	2	3	4	5
	1	NO GO	NO GO	NO GO	---	---
	2	NO GO	NO GO	NO GO	---	---
	3	---	NO GO	NO GO	---	---
	4	---	---	GO	GO	---
	5	---	---	GO	GO	GO

A "no go" video signal report will be given in the same manner as the audio inoperative site report. For example, a report of a "no go video signal at 1 by 2" describes the perceptibility as "picture content is impossible to ascertain" and the objectionableness as "very annoying."

TABLE 4

Greenwich Mean Time

Greenwich Mean Time (GMT) is a world-wide standard used as a universal reference time. GMT is sometimes abbreviated "UT" for "universal time" and sometimes abbreviated "Z" because it is based on the time at Greenwich Observatory near London, on the "zero meridian". When spoken, the phonetic "zulu" is used for "Z".

GMT is ideally suited for the HET network which involves many experimenters in various time zones. For this reason, NASA uses GMT for satellite-scheduling and record-keeping. Therefore, (1) STD site operators must have a general knowledge of GMT in order to understand the schedules, and (2) using the GMT Conversion Tables, pages 7-8, SITE OPERATORS WILL RECORD THE CORRECT ZULU TIME ON ALL BROADCAST AND ENGINEERING REPORTS. This includes Site Status Reports, for routine checks, failure and repair occurrences, and any additional reports that will be required in the future.

For a completely correct explanation, although it will not be used, note that the GMT *date* will often differ from the Rocky Mountain region date along with the time. For example, when it is 2100 MDT (9 PM), it is 0300 Z (3 AM). Therefore, in this case, Greenwich Mean Time is the next day relative to Mountain Daylight Time. Again, this fact is mentioned only for accuracy in explanation. All reports will be filled out using the Rocky Mountain region date along with Greenwich Mean Time.

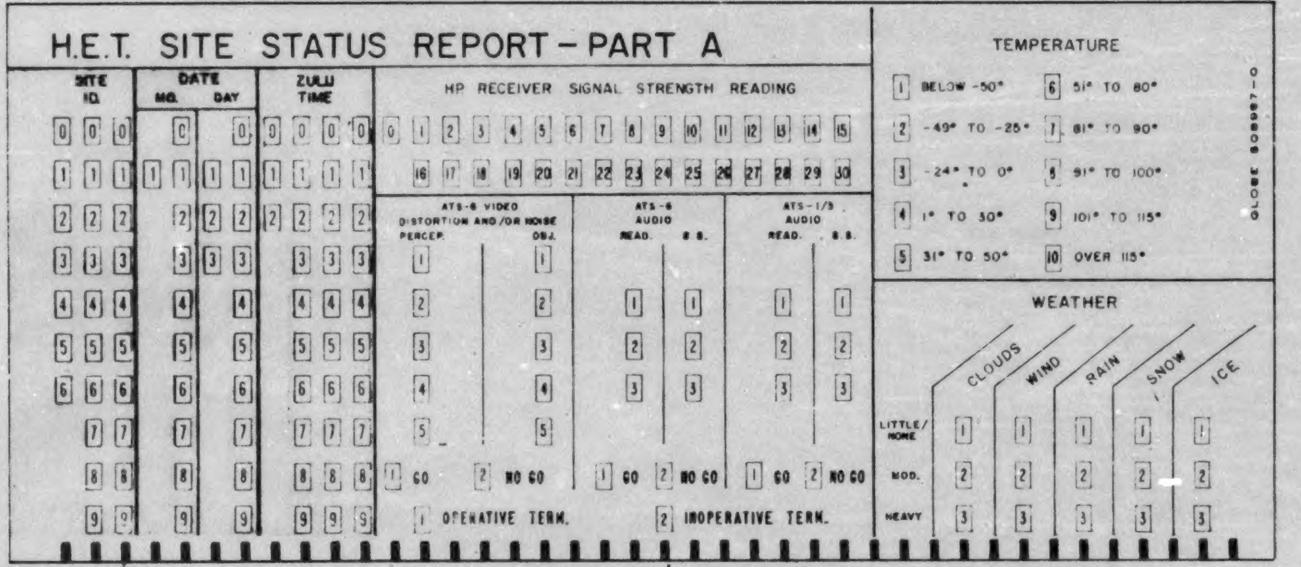

H.E.T. SITE STATUS REPORT – PART A
SITE ID.
DATE
MO.
DAY
ZULU TIME
HP RECEIVER SIGNAL STRENGTH READING
ATS-6 VIDEO DISTORTION AND/OR NOISE
PERCEP.
OBJ.
ATS-6 AUDIO
READ.
S.S.
ATS-1/3 AUDIO
READ.
S.S.
GO
NO GO
OPERATIVE TERM.
INOPERATIVE TERM.
TEMPERATURE
BELOW -50°
-49° TO -25°
-24° TO 0°
1° TO 30°
31° TO 50°
51° TO 80°
81° TO 90°
91° TO 100°
101° TO 115°
OVER 115°
WEATHER
CLOUDS
WIND
RAIN
SNOW
ICE
LITTLE/NONE
MOD.
HEAVY
GLOBE

FIGURE 5
OMR CARD

The attributes for "adequacy of site operator performance" were performing required tasks and performing them correctly. It must be remembered that the remote terminal configuration was developed with the generally non-technical background of the user in mind. Consequently, site operator attitude was closely associated with the quality of performance. Specifications for operational procedures and evaluation requirements were written as simply as possible. Nevertheless, other considerations had to be accommodated, and the result was an attempted balance between conjectured site-operator capabilities and total HET networking requirements. Multi-time zones, limited and specific time use of the network by each of the six HET Experimenters, and information needed for daily satellite control and configuration were some of the factors that influenced final training requirements for the remote terminal operator. In turn, the site operator, by both opinion and performance, was able to confirm or deny the reasonableness of the system. For this reason, a separate **Site Operator Opinion Poll** was developed to examine the psychological disposition of the user at various times throughout the Demonstration. Included in the poll were questions concerning the users' points-of-view about the overall operational ease of the equipment, operational procedures, and hardware data-gathering requirements. The results of the poll were very encouraging and have been discussed in detail in the section, "Results and Conclusions."

HET NETWORK COORDINATION

Coordination of the HET network began with the pre-operational development phase of the Experiment. During that time, a series of meetings were held for the six Experimenters and NASA officials to develop a mutual understanding of goals and needs of each experiment and to provide further details about the capabilities of the satellite system being developed. Patterns of information and needs evolved which were the basis for agreements among the Experimenters and for a network specifications plan. In conjunction with the plan, the **Site Operator Manual** was developed which contained equipment usage information and operational procedure specifications. These procedures formed the cornerstone of the coordination effort.

With the launch of the ATS-6 in May, 1974, and after a series of system checkouts, the HET network became operational in July, 1974, whereupon the NCC in Denver became the nucleus for receiving, transmitting, relaying, monitoring, and controlling all HET network user activities, and all procedures and equipment developed for network coordination were routed through or existed at the NCC.

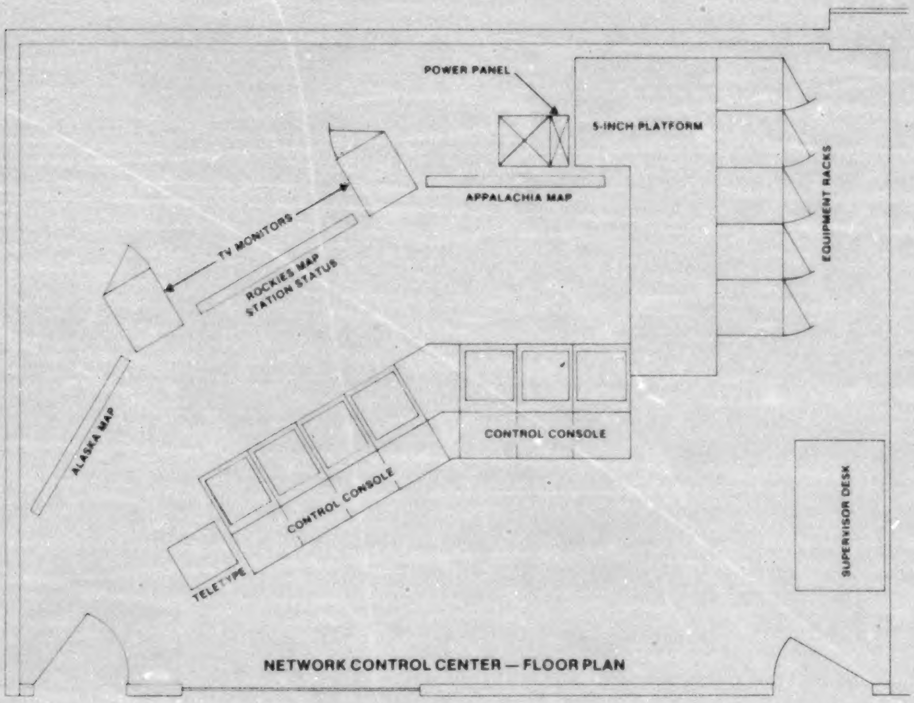

POWER PANEL
5-INCH PLATFORM
EQUIPMENT RACKS
APPALACHIA MAP
TV MONITORS
ROCKIES MAP
STATION STATUS
ALASKA MAP
CONTROL CONSOLE
CONTROL CONSOLE
TELETYPE
SUPERVISOR DESK
NETWORK CONTROL CENTER — FLOOR PLAN

FIGURE 6

Control and interface capabilities at NCC were derived from both administrative prerogative and equipment attributes. For example, verbal or technological directions from NCC to the sites superseded all others. The different operational control and interface tasks have been discussed in the remainder of this section.

ATSOCC INTERFACE

NCC was added to the NASA Communications Network (NASCOM) to interface with the Applications Technology Satellite Operations Control Center (ATSOCC). The ATSOCC communications linkage consisted of a mechanically switched teletypewriter and a dedicated SCAMA (Switching, Conferencing, and Monitoring Arrangement) phone line. NASA's primary switching center at Greenbelt, Maryland, was the central source for schedules and technical operations information. In turn, NCC generated remote network status data for transmission to the affiliated NASCOM stations.

MULTI-SIGNAL ROUTING AND MULTI-OUTPUT SWITCHING

Contained in a rack in NCC were two patch panels, one for audio and one for video. Each panel was "normaled" into standard daily routes, requiring simple dial-up and turn-on techniques at the operator's console. (At the onset of the Experiment, the video and audio patch panels were not normaled, making signal routing difficult. However, this problem was corrected early in operations.) Seated in front of the audio board and video switcher which were located side-by-side on the console, the operator could select from 9 video inputs and from an audio system having 20 inputs, 8 mixer channels, and 6 outputs. When a non-normaled route was required, the operator returned to the patch panel and, with any number of video and/or audio patch cords, rechanneled signals both into and out of NCC.

TELEVISED ANNOUNCEMENT

For coordinating purposes, which included transmitting previews, program titles, emergency network information, and special directions to site operators, a "character generator" was used. It transmitted typed information which was first set up and checked on a preview monitor, and then was used "on-line."

PRE-PROGRAM POLLING

Predetermined protocol procedure enabled NCC to receive remote network status reports during a specified pre-program lineup time. Information was recorded on a network log and relayed to ATSOCC for satellite pointing and configuration checkout. This system was used for five of the HET Experiments; the Veterans Administration experiment in the Appalachian region did not require the VHF capability. The VA sites were polled by telephone. Depending on the number of the operating stations, pre-program site polling took 5 to 15 minutes.

MONITORING

Facing the NCC operator console, there were specially designed mapboards which presented visually the three geographical regions in the HET Experiments: the Rocky Mountain region, the Appalachian region, and Alaska and the Pacific Northwest. The board was used as a visual monitoring reference for all HET remote stations which were displayed by location and equipment-configuration indications (ROT-IT-Truth). (The mapboard has been discussed as part of the digital control system.)

The operators monitored video signals on two 19-inch color monitors and three 17-inch black and white sets. One color monitor received C-band and S-band signals via a 12.5 GHz microwave relay from the Morrison Earth Station which was the location of the Denver Uplink. Another color monitor was used to observe the signal being transmitted on-line from NCC to the uplink station. Of the three remaining monitors, one was used for character generator preview, one for preview of materials about to be transmitted from NCC, and one as a spare.

In addition to the monitors, a waveform oscilloscope, mounted in the console, was used to check the technical parameters of the various signals, including video level, sync, and color burst.

The uplink station was also equipped with the waveform oscilloscope, video monitors, and necessary test equipment for both baseband and rf measurements, thus providing an extra measure of quality control.

The Veterans Administration experiment did not require VHF; therefore, a dedicated phone, separate from the direct-dial phone for polling and failure reporting, was used between NCC and the VA program origination center at KMGH-TV in Denver, Colorado.

FAILURE REPORTING

By means of the pre-program polling and monitoring methods already described, NCC could provide remote network status in an on-off mode at the 24 sites having two-way VHF capabilities or, as in the case of the Veterans Administration experiment, having the special telephone link. All remote site operators were provided with specific operational standards to use (i.e., "Was the terminal operative?" and "Was it operating in such a manner that the signals received were adequate for audience viewing and listening?"). Documentation required by the engineering staff necessitated knowledge of the operational status of sites not polled. Furthermore, because the STD had maintenance and repair responsibilities for three of the HET Experiments, equipment failures at all sites had to be reported. In the Appalachian Educational Satellite Project (AESP), STD maintenance personnel located in that area received equipment failure reports from the AESP control center in Lexington, Kentucky. In the Veterans Administration experiment and the Satellite Technology Demonstration, site operators were required to report, via direct-dial phone to NCC, any deviation from the normally prescribed operational status of equipment, thus providing immediate troubleshooting with the operator and the prompt dispatch of STD engineers.

ADDITIONAL INTERNAL INTERFACE CAPABILITIES

Three in-house phone extensions were used by NCC operators for additional supervisory contact with engineering and administrative staff at STD; an Intercom system was used for communications with production personnel.

NETWORK REDUNDANCY

Alternative backup systems for equipment failures, including the satellite, were developed. The plan provided for contingencies including: (1) restructuring the network communication plan, in both temporary and prolonged failure situations; (2) compensating for malfunctions at STD sites; and (3) rescheduling missed programs. Coordinating all HET contingency actions was the responsibility of NCC. In instances of VHF failure from either NCC or the DUT, land-line arrangements interconnecting satellite facilities at the Bureau of Standards in Boulder, Colorado, and General Electric Co. in Schenectady, New York, were used to maintain contact with ATS-3 and ATS-1.

In instances of ATS-3 transmitter failure at Morrison, a 90-Watt transmitter on the third floor of the NCC building was used. For Alaska, an additional backup was provided by a phone-line link to the Alaskan transmitting station. During an ATS-6 system failure, land-line arrangements with the Rocky Mountain Public Broadcasting Network Delay Center enabled programs to be routed via PBS land-lines to participating public television stations.

VHF DIGITAL CONTROL AND TWO-WAY DATA

The counterpart of the digital control device built into the VHF system at the remote sites was a Master Digital Coordination/Control unit at NCC. The custom-designed system was comprised of control, display, and interface devices. The basic network control and interface functions planned were: (1) establishing a visual indication of transmission between Denver and the remote sites; (2) arranging for transmissions between remote sites for other HET network users; (3) accepting questions during the interactive mode of operation in the Rockies; (4) monitoring and recording all transmissions; (5) assisting other HET network users with their programs and executing remote control operations; and (6) providing an automatic shutdown capability for the network in the event of an emergency or inappropriate use of the network.

The Denver VHF transmitting and receiving systems were located at the uplink station, rather than at the NCC, because pre-operational testing suggested that the building housing the NCC had an extremely noisy **rf** environment. Since VHF activity occurred simultaneously on two satellites, numerous dedicated phone links were required between NCC and Morrison, and digital and voice communications were transmitted over these phone lines. The microwave link could have been used to provide this service at less cost, but it was not planned for because initially the program content required the four audio channels for multi-language broadcasts.

The control function required computer services and a Hewlett Packard 2100A was leased. It was designed for use in real-time mode for daily network operations. Data flow and processing were planned for three main tasks: (1) data was to be sent and received to and from the remote network sites; (2) data was sent to the earth station for control of the VHF equipment; and (3) data was to be sent to the visual display mapboard system in the NCC. A CRT (Computer Remote Terminal) Keyboard and Display was utilized in the NCC to assist network operations.

The CRT, used when operating with the computer, exhibited incoming calls to inform the network operator that a call had been received, and commands sent to the remote sites were also displayed to maintain an active presentation of network status. Further, status of control functions at the earth station were retained, giving the operator all the information necessary to control the system.

The mapboard system, visible to all NCC personnel, was used as an aid to the operators as well as for general display. The control board was a map with all remote sites identified with lights: red, green, amber. Based on information fed to the computer from the remote sites or the network operator, the lights represented site operational status.

DENVER UPLINK TERMINAL (DUT)

HET Experiments required a satellite earth station capable of originating a single video channel with four associated program channels to each of the regions served. The annual cost of leasing terrestrial lines from Denver to NASA stations in Rosman or Mojave was approximately $762,000 and $561,000, respectively.

To access the ATS-6 in any of the coverage modes, it was necessary to interface with the global-beam antenna on the spacecraft. This beam intersects one-third of the earth's surface, an area 20 times larger than any of the regions in which HET terminals were located. The required power and sensitivity of a station designed to access the global beam are approximately 20 times greater than that of a station which interfaces with a spot beam of ATS-6. Accordingly, the cost of such a facility is much higher.

It was determined that a new uplink facility (Morrison) would be considerably less expensive than a year's lease of terrestrial lines to either Rosman or Mojave. Curiously, quotations received by STD to lease a 4/6 GHz station for one year exceeded the capital cost of the item.

The National Institute of Education authorized FRMS to procure the uplink complex in July, 1973. As ATS-6 was to be launched in May, 1974, fewer than 11 months remained to procure and integrate the system. Despite a disaster which destroyed the antenna system in December, 1973, the STD uplink was operational in June, 1974, when NASA scheduled the first complete test of the HET communications network.

CONFIGURATION AND SCHEDULE

The STD uplink was located in a valley two miles south of the town of Morrison, Colorado. The natural shielding of the surrounding mountains enabled the earth station to share the 4/6 GHz frequency band which is used extensively by commercial terrestrial systems in the Denver vicinity. The uplink complex complied with all FCC requirements pertaining to coordination of fixed-satellite earth stations. The STD retained Compucon of Dallas to perform the analysis involved in meeting FCC and Interagency Radio Advisory Committee regulations. Compucon also cleared the 12.5 GHz microwave relay that interconnected the uplink with the STD offices located 12 miles away in downtown Denver.

The uplink was designed for operational simplicity and low cost. Ninety-five percent reliability was considered adequate in view of the experimental nature of the Project and the fact that NASA stations at Rosman and Mojave were available for backup. (Commercial satellite stations normally are designed to achieve a reliability of 99.99 percent or greater. This stringent requirement necessitates complete redundancy of all critical subsystems and elaborate control circuitry to detect failure and institute corrective action. The functional simplicity and lack of redundancy in the STD uplink kept the cost to less than one-third the cost of a comparable commercial facility.)

The station used an 11-meter (36-foot) prime-focus antenna, a 3 kilowatt transmitter, and a 90° K uncooled parametric amplifier, which provided an EIRP of 84 dBW and a G/T of 29 dB/°K. Radiation Systems, inc. (RSi) and Farinon Electric, Inc., were the prime contractors. The major subcontractors were Aydin Energy Systems, Airborne Instruments Laboratories (AIL), and California Microwave. The components of the station were of the highest quality, but there was no provision for catastrophic failure of key subsystems.

The only non-standard feature of the uplink complex was the requirement of four, rather than one, audio subcarriers on the video. This signal format had previously been established in the design of the Receive-Only Terminal (ROT) electronics supplied by Hewlett Packard. To minimize the impact of this peculiarity on the cost and delivery of the earth station, the modulator and demodulator were contracted separately. The electronics supplied by the prime contractor of the earth station (RSi) were standard items. Farinon provided the custom FM modulator and the same

Hewlett Packard receiver as that used in the ROT's served as the demodulator.

The schedule for implementation of the STD uplink complex was extremely tight, as indicated in Table 5. NIE permitted the STD to contract directly with the equipment suppliers, making it much easier to meet the associated deadlines.

TABLE 5

Significant Events of STD Uplink Complex

Date	Event
FEBRUARY 22, 1973	REQUEST FOR QUOTATIONS RELEASED ON 4/6 GHz STATION
JULY 17, 1973	NIE AUTHORIZED STD TO PROCURE STATION
JULY 20, 1973	CONTRACT SIGNED WITH RADIATION SYSTEMS, INC.(RSI)
OCTOBER 2, 1973	LEASE AGREEMENT CONCLUDED FOR LAND
OCTOBER 16, 1973	CONTRACT SIGNED WITH FARINON ELECTRIC FOR MICROWAVE RELAY
NOVEMBER 16, 1973	CHIEF ENGINEER FOR UPLINK HIRED BY STD
NOVEMBER 28, 1973	CONTRACT SIGNED WITH AMERICAN DATA CORP FOR MODULATOR
DECEMBER 1, 1973	INITIAL SITE PREPARATION COMPLETED
DECEMBER 17, 1973	RSI's INITIAL ANTENNA SYSTEM COLLAPSED
FEBRUARY 28, 1974	CONSTRUCTION OF MICROWAVE TOWERS COMPLETED BY STD
APRIL 1, 1974	POWER AVAILABLE; SITE PREPARATION COMPLETED
APRIL 3, 1974	FINAL ACCEPTANCE OF FARINON MICROWAVE RELAY
MAY 30, 1974	LAUNCH OF ATS-6
JUNE 16, 1974	SUCCESSFUL TEST OF UPLINK COMMUNICATIONS SYSTEM
JULY 2, 1974	BROADCASTING INITIATED BY STD UPLINK
AUGUST 6, 1974	CONTRACT AWARDED FOR IMPROVED MONITORING SYSTEM
OCTOBER 3, 1974	CONTRACT AWARDED TO FARINON FOR IMPROVED MODULATOR
NOVEMBER 5, 1974	ANTENNA-HEATER SYSTEM INSTALLED
DECEMBER 10, 1974	FINAL ACCEPTANCE GRANTED TO RSI
MAY 20, 1974	HET BROADCASTING TERMINATED

SPECIFICATIONS AND PROCUREMENT

The basic intention of the development of the uplink was to create an inexpensive station that would be functionally simple. STD wished to issue fixed-price contracts for the key elements of the complex and avoid the necessity of issuing later change orders that would affect price and schedule.

STD benefited from the advice of industry representatives, private consultants, and NASA personnel in arriving at a final set of specifications. Three drafts of the earth station specifications were prepared before a request for quotation was released on February 22, 1973. Additional modifications were incorporated during subsequent negotations with suppliers.

The timing of the procurement was ideal, preceding larger orders from common carriers by approximately 12 months. Potential suppliers wished to establish their national and international credentials by installing what appeared to be a comparatively simple, low-risk system. Twenty-three companies attended the bidders' conference, and there were seven serious proposals.

Negotiations could have been completed by the end of April, 1973, but NIE approval of the procurement was withheld pending a review of the scope of the Project. STD was afforded the unwanted luxury of three additional months to conduct an exhaustive review of the prospective suppliers.

The delay proved to be beneficial. Two of the three low bidders had never constructed a satellite earth station. Contract officers from companies having prior experience with the prospective suppliers were remarkably candid in describing their strengths and weaknesses. These individuals provided STD with the benefit of hindsight, e.g., suggesting contract provisions which initially had not been included. Because of the competitiveness of this procurement, STD succeeded in negotiating most of these clauses into the contract with the chosen supplier. In view of later difficulties, this was indeed fortunate.

NIE approved the procurement on July 17, 1973, and STD signed a contract with Radiation Systems, inc. (RSi) on July 20, 1973. RSi was the lowest technically qualified bidder.

Procurement of the microwave relay proceeded concurrently with activity on the earth station. The non-standard signal format required in the HET Experiments presented a complication which was not resolved until September, 1973. Six qualified suppliers were asked to bid on three options:

(1) a baseband-to-baseband duplex system, providing one video and four audio channels;

(2) a system which incorporated the custom signal format, providing a baseband interface to the NCC and an intermediate-frequency interface at the earth station; and

(3) one baseband-to-baseband link (earth station to studio) and one baseband-to-rf link (studio to earth station).

Five of the six suppliers submitted a bid, and all elected to bid only on the first option. STD prepared a request for quotations based on this approach and asked the six companies to quote on September 7, 1973.

Farinon Electric was the lowest technically qualified bidder. NIE approved the procurement on October 15, 1973, and a contract between Farinon and STD was signed on October 16, 1973.

The problem of incorporating the 4-channel signal format at the earth station, which was necessary to interface with the Receive-Only Terminals, was still unresolved. Five companies were asked to bid on the required FM modulator on November 5, 1973. The only company which responded, the American Data Corporation, was awarded the contract. This company had built test sets for STD but had no prior experience with FM modulators, which are technically demanding.

The modulator required constant maintenance, necessitating the purchase of a replacement modulator. Farinon agreed to build this replacement on October 3, 1974, and manufactured and installed this item in fewer than 60 days.

IMPLEMENTATION

It was hoped that Western Telecommunications, Inc. (WTCI, a common carrier that intended to operate a satellite earth station in the Denver area) would sublet an appropriate site to STD for the duration of the HET Experiment. WTCI, however, encountered difficulties acquiring the proposed land, and the Project was forced to obtain its own site.

The land had to be rezoned and processed for frequency clearance. These tasks were accomplished by October, 1973. The land was cleared, an access road was provided, and housing installed by December, 1973. All of this work was coordinated with subcontractors.

RSi began erecting the earth station in mid-December, approximately one month ahead of the contract schedule which called for completion of the station by mid-February. The II-meter antenna collapsed in a wind and snow storm 18 hours after it was installed, casting serious doubt on the likelihood of completing the installation in time for the launch of the ATS-6.

Subsequent negotiations with RSi were extremely delicate. Since RSi had not obtained a performance bond, STD had no choice but to work with RSi and attempt to avoid a repetition of the earlier catastrophe.

STD and RSi worked diligently to fabricate a new antenna structure that was considerably stronger than the earlier model. The station was operational by early June, 1974, 10 days after the launch of ATS-6. Although construction of the second, stronger antenna represented a significant change in the original specifications, the final cost was increased by less than six percent. Resolution of the contract proved to be time-consuming; the contract was closed on December 19, 1974.

Installation of the microwave relay proceeded according to schedule. STD constructed the necessary towers, but Farinon Electric agreed to assume responsibility for the complete system. Farinon's performance under the contract was flawless; the microwave relay performed to specification without any on-site debugging.

OPERATIONS

HET broadcasting commenced in July, 1974; and engineering personnel learned to operate the uplink equipment by means of an on-the-job training program. These personnel had extensive background in television broadcasting but no previous experience with satellite earth stations. First priority was to master the basics of the microwave portion of the uplink complex, where there was insufficient funding for spare parts and where failures could be catastrophic. This task was accomplished by July, 1974, at which time it was possible to concentrate on baseband video processing.

As the uplink provided a final check on the signal quality of the outgoing programming, additional test equipment was purchased in August to maintain better quality control. Operational experience provided the engineering staff with the perspective necessary to arrange the equipment in a manner which maximized convenience of operation and reliability. The layout of the station has been shown in Figures 7 and 8.

By the end of September, 1974, operation had become routine. A series of pre-broadcast checks and maintenance procedures were instituted which assured quality, reliable operations throughout the duration of the Demonstration.

A final modification of the complex occurred in October after an accumulation of wet snow on the antenna reduced the Effective Isotropic Radiated Power (EIRP) by 9 dB. Within two weeks STD procured and installed a heater system to prevent snow accumulation.

COST

The capital cost of the STD uplink complex (approximately $366,000 including spare parts and supplies) was very close to the amount projected in July, 1973. Consulting and legal fees well in excess of the original projections resulted from contractual difficulties associated with the collapse of the antenna structure.

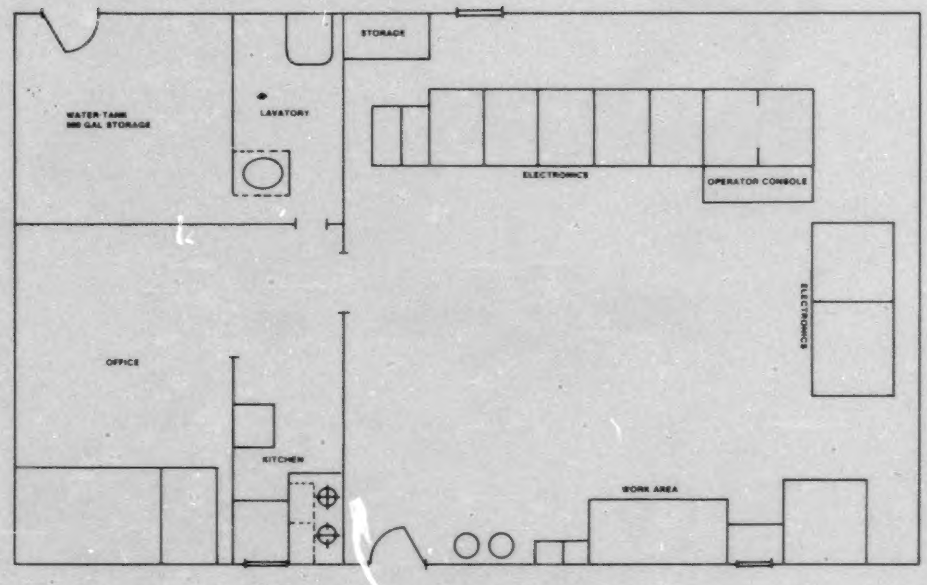

WATER TANK
GAL STORAGE
LAVATORY
STORAGE
ELECTRONICS
OPERATOR CONSOLE
ELECTRONICS
OFFICE
KITCHEN
WORK AREA

FIGURE 7
STD UPLINK STATIONS LAYOUT

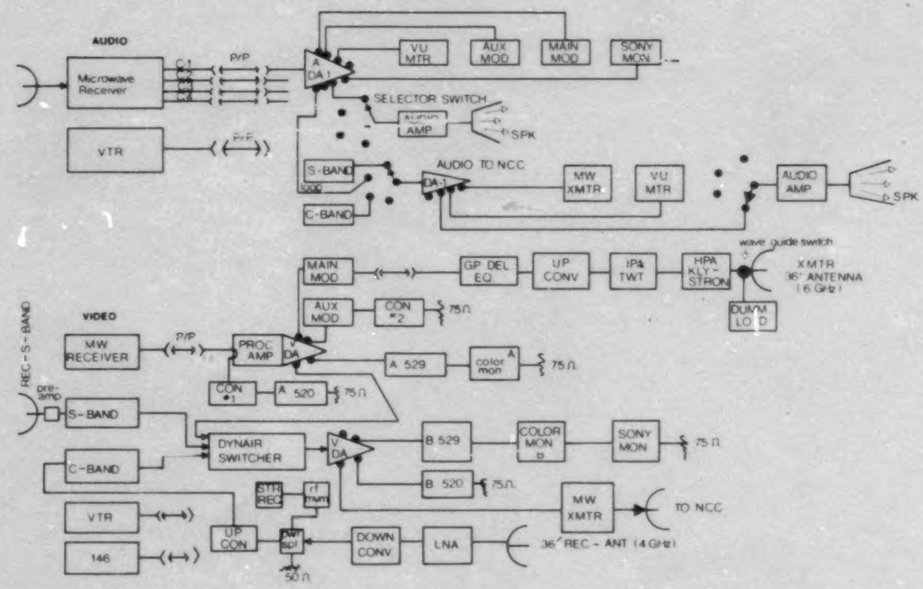

AUDIO
Microwave Receiver
C1
C2
C3
C4
P/P
A DA 1
VU MTR
AUX MOD
MAIN MOD
SONY MON
SELECTOR SWITCH
AUDIO AMP
SPK
VTR
P/P
S-BAND
loop
C-BAND
AUDIO TO NCC
DA-1
MW XMTR
VU MTR
AUDIO AMP
SPK
wave guide switch
MAIN MOD
GP DEL EQ
UP CONV
IPA TWT
HPA KLY-STRON
XMTR 36' ANTENNA (6 GHz)
DUMM LOAD
AUX MOD
CON #2
75Ω
VIDEO
REC-S-BAND
MW RECEIVER
P/P
PROC AMP
V DA
A 529
color mon A
75Ω
CON #1
A 520
75Ω
pre-amp
S-BAND
DYNAIR SWITCHER
V DA
B 529
COLOR MON B
SONY MON
75Ω
C-BAND
B 520
75Ω
STR REC
rf mvm
MW XMTR
TO NCC
VTR
UP CON
pwr spl
DOWN CONV
LNA
36' REC - ANT (4 GHz)
146
50Ω

FIGURE 8
AUDIO/VIDEO SCHEMATICS FOR STD UPLINK

INSTALLATION AND MAINTENANCE

The installation and maintenance procedures used for the ground segment, specifically included: (1) the framework within which the system had to be developed; (2) anticipated installation and maintenance procedures; and (3) actual procedures that evolved in response to unforeseen constraints.

INSTALLATION

Two types of terminals were to be installed at 69 locations in the Rocky Mountains. The detailed characteristics of the Receive-Only Terminals (ROT's) and Intensive Terminals (IT's) have been described in the previous section, "Operational System." It was necessary to find an appropriate location for the 10-foot parabolic antenna of the ROT's and helical antenna of the IT's, to fence the area, mount the antennas, integrate the electronics, and in general to leave the site in an operational condition whereby non-technical persons could initially acquire the satellite and thereafter operate the terminal(s) indefinitely. In addition, because of the temporary nature of the Experiment, the terminals had to be installed in a manner that would permit eventual restoration of the site to its original condition.

In the proposal submitted to the Office of the Secretary, DHEW, in October, 1972, the STD planned to utilize state organizations having prior communications experience in the installation and maintenance effort. The primary benefit of this plan was in the area of maintenance — technicians could respond more quickly to failure reports from the field.

In discussions with DHEW, however, it was decided that costs could be reduced by developing a central staff to perform installation and maintenance. This philosophy extended also to purchasing and storage; all purchasing was coordinated by the STD headquarters in Denver and all spare parts were stored in Denver.

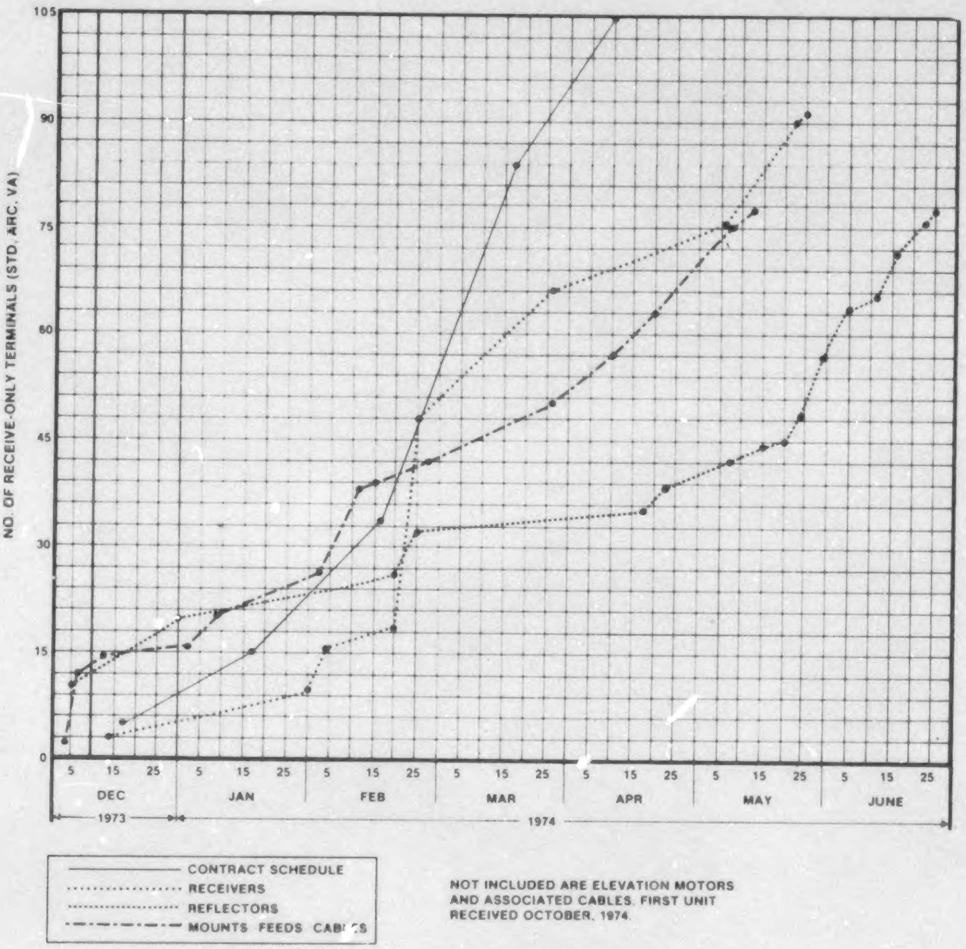
A three-man installation crew was organized. A maximum of two visits per site was contemplated. If necessary (based on reports from the site coordinator that there would be complications), engineering personnel would conduct a pre-installation site survey. Allowing one day of travel between sites and assuming a five-day work week, a minimum of 27 weeks would be required for one crew to install 69 ROT sites. To complete the installations by the end of March, 1974, in anticipation of an April launch of the ATS-6, delivery of complete systems should have begun by mid-September, 1973, and ended by mid-March, 1974.

In July, 1973, DHEW signed a contract with Westinghouse to provide 130 ROT's. The schedule of the original contract called for delivery of the last ROT in March, 1974. Had this schedule been observed, it would have been possible to complete the ROT installation by May, 1974.

The STD purchased a mobile home (27 feet in length) for use by the installation personnel. The vehicle was the principal living quarters for the team away from Denver. In addition, a 3/4-ton pickup truck was purchased to transport hardware from the nearest shipping dock and spare parts from Denver to the site.

Two developments significantly altered the planned installation procedures: (1) a decision by the Interagency Radio Advisory Committee denying the use of the 2.25 GHz uplink frequency by Intensive Terminals in January, 1973, and subsequent delays in procuring the IT's; and (2) delays in the delivery of the ROT components. The adverse decision by IRAC made it necessary to redesign the IT's for use of the VHF frequencies on the ATS-1 and the ATS-3. The 50 transmitters required by Alaska and the STD were not procured until November, 1973. Custom modifications that were performed by B & E were not completed until August, 1974—three months after the launch of ATS-6.

The most serious complication relating to installation was the phasing of the deliveries. To complete the installation in one trip, it obviously was necessary to have a complete set of parts from the prime contractor. As indicated in Figure 9, the parts came in three widely separated shipments—first the mounting hardware for the reflector, then the electronics, and finally the segmented reflector.



NOT INCLUDED ARE ELEVATION MOTORS AND ASSOCIATED CABLES. FIRST UNIT RECEIVED OCTOBER, 1974.

FIGURE 9 HARDWARE DELIVERY

In retrospect, it would have been prudent to ship all parts to Denver and not travel to a site until the shipment had been completed. However, B & E was concerned about performing installation work during the winter and wished to accomplish as much as possible during the fall. In September, 1973, the specifications for the antenna foundation still had not been established. Consequently, it was not possible to complete even the site preparation in one trip. The fencing was installed between September and January, 1974. Mounting timbers that served as the foundation for the antenna were installed between December, 1973, and May, 1974.

The fencing and timbers were installed in a manner that would permit convenient removal. The fence posts were hand-driven to a depth of 24 inches and secured by both top and bottom anchors. The timbers were secured using an expanding-type anchor that was buried to a depth of five feet, flattened, and then backfilled. A 5/8-inch diameter rod connected the anchor to the timbers. Differences in soil density caused variations in this procedure. The overall results were excellent, and there was not a single instance of structural failure of the fencing or other outside hardware during the Demonstration. (However, some isolated cases of vandalism did cause minimal structural damage.)

The initial pointing of the antenna was accomplished using a simple magnetic compass and an elevation protractor. Only one site was outside the ±20° tolerance in azimuth, thus requiring relocation of the timbers.

The actual site locations were chosen with the aid of the eight state coordinators. Requirements for a location included: (1) line-of-sight clearance with ATS-6 (and with ATS-3, in the case of an Intensive Terminal); (2) a cable run of fewer than 100 feet from the antenna to the classroom; and (3) compliance with all local building codes and environmental requirements. The state coordinator referred questionable cases to the STD staff for final resolution.

MAINTENANCE

All of the terminal equipment used by the STD was experimental in nature, making it impossible to plan a maintenance program with any degree of certainty. An operational goal of the Project was to effect repairs in 24 hours. Failure reports were directed to NCC personnel and then forwarded to the maintenance team. At the conclusion of maintenance activities, the report was completed and filed. Included in the report were time of failure, failure symptoms, repair action taken, and date and time of repair action. In all cases, the maintenance function was accomplished at the site.

PROCUREMENT

Four tangible elements of the HET ground system were originally planned as Broadcast and Engineering responsibilities: (1) the Network Coordination Center (NCC); (2) HET ground terminal equipment, including installation and maintenance; (3) the Morrison uplink facility; and (4) an STD production facility. These have been discussed separately in following sections. In Table 6, the responsible agency, the main equipment items, and the systems procured costing over $25,000 have been shown.

TABLE 6

STD Engineering Equipment/Systems Procurement Over $25,000

ALL EQUIPMENT AND SYSTEMS FOR BROADCAST AND ENGINEERING WERE PROCURED THROUGH STANDARD COMPETITIVE-BID PROCEDURES.

ITEM / SYSTEM	SUPPLIER	RESPONSIBLE PROCUREMENT AGENCY
ROT'S	WESTINGHOUSE	DHEW
VHF/TX, RX	GENERAL ELECTRIC	DHEW
VHF/DIG. COORD.	CENTERLINE	STD
VHF/HELICAL	ELECTRO MECHANICAL PRODUCTS	STD
STD UPLINK	RADIATION SYSTEMS, INC. FARINON ELECTRONICS, INC.	STD STD
ARC INSTALLATION	COSMOS	STD
NCC/ELECTRICAL WORK	HOWARD ELECTRIC	STD
NCC/BROADCAST EQUIPMENT	DATAVISION, TELEMATION, AVR, MAGNASYNC MOVIOLA CORP, CONRAC, TEKTRONIX, HEWLETT PACKARD, AMP, INC. RICHMOND HILL LABS, THE GRASS VALLEY GROUP, INC.	STD
STUDIO/FILM CHAIN	RCA	STD
STUDIO/AIR-CONDITIONING	COMFORT TRANE	STD
NCC/DRY WALL AND SHEET METAL WORK	PARTITIONS, INC.	STD
REMOTE SITES / INSTALLATION MATERIALS INCLUDING FENCING, TIMBERS, COAXIAL CABLE	LOCAL CONTRACTORS IN THE REGION	STD
STD STUDIO (SUBLEASED)	LEVITZ	STD

The STD engineering staff retained its original (October, 1972) responsibility to design, install, and maintain the NCC in Denver. However, the inability to use the ATS-6 for two-way communications did require the addition and accommodation of VHF equipment. Specifications for all subsystems to be integrated into the facility were written by Project engineering staff and items procured were either specially designed and built by the STD or let out for bid. Contracted labor and consultants were used for building partitions and sheet-metal work, electrical work, and integration.

HET GROUND TERMINAL EQUIPMENT

Changes in procurement plans occurred when the DHEW chose to manage the contracts for ROT equipment and the VHF transmitter and receiver equipment. However, the Broadcast and Engineering component retained all other responsibilities for ROT and IT antenna design and for the VHF digital coordinator.

In the original plan, the STD had the responsibility for installing and maintaining all HET remote sites, including those in the Alaskan region.

Project staff did in fact assist in the delivery of the Alaskan VHF equipment, but ROT equipment was delivered to Alaska by the subcontractors. However, the Alaskan experimenters preferred to manage their own installation and maintenance, and the STD agreed.

In the Rocky Mountain and Appalachian regions, some of the early planning to include regional organizations in installation and maintenance activities had to be dropped due to time constraints and lack of funds. The plan actually implemented specified a centralized staff within the STD, supplemented by subcontracts under the direct control of the Broadcast and Engineering component. This plan worked well due to the central location of Denver and excellent air service into most of the region.

MORRISON UPLINK COMPLEX

Procurement of the Morrison uplink complex, consisting of 10 acres of land, an access road, utilities, a 4/6 GHz earth station, and a microwave relay interconnecting the uplink with the STD studio 12 miles away, was administered by the Project. Aided by outside consultants and NASA personnel, the engineering staff provided detailed specifications for all subsystems. Competitive procurements were conducted in all cases in accordance with NIE guidelines.

A list of suppliers of the Morrison complex has been presented in Table 7.

TABLE 7

Morrison Equipment Suppliers

ITEM	SUPPLIER	DATE OF AWARD	PRICE
4/6 GHz EARTH STATION	RADIATION SYSTEMS, INC.	JULY 20, 1973	$ 274,995
MICROWAVE RELAY	FARINON ELECTRIC, INC.	OCT. 16, 1973	39,749
DUT MODULATORS	AMERICAN DATA CORP.	NOV. 28, 1973	10,016
	FARINON ELECTRIC, INC.	OCT. 3, 1974	12,000
AUDIO/VIDEO ROUTING SYSTEM	AUDIO/VIDEO SYSTEMS, INC.	AUGUST 6, 1974	5,960
ANTENNA-HEATER SYSTEM	WATLOW ELECTRIC, INC.	OCT. 23, 1974	2,118
	BRUG ELECTRIC, INC.	OCT. 23, 1974	1,285
MORRISON LAND LEASE (2 YEARS LEASE AT $4,000 / YR.)	PALLAORO ESTATES	OCT. 2, 1973	8,000
SITE PREPARATION	VARIOUS	OCT. / 73-MAR. / 74	12,192
SPARE PARTS	VARIOUS	JUNE/74-MAY/75	8,349
		TOTAL	$ 366,315

STD PRODUCTION FACILITY

During the developmental phase of the Project, cost constraints forced the plan for STD production facilities to be modified. After using the competitive-bid procedure, equipment for the studio was subleased. Additionally, shifts in component structure and responsibilities resulted in the Production component assuming the task of maintenance for the studio during the operational phase of the Project.

FIELD SERVICES NETWORK

The need to be responsive to the user constituency directed the Demonstration from the beginning. A Utilization component was established to assess the needs of the region and provide the opportunity for users to participate in program design and in product modification; a continuing dialogue with the users was encouraged throughout the Demonstration. Out of this user-directed philosophy came a corollary requirement for a public information effort to communicate the progress and results of the Demonstration to its participants and to the general public.

The following section documents the activities necessary to establish and maintain a user-responsive educational communications system.

The Project's Field Service staff was charged with the responsibility of developing and operationalizing a field structure through which STD tasks could be addressed. The regional nature of the Project necessitated a three-tiered organization involving the regional organization and state and local agencies. This organization facilitated information flow among the three levels and fostered user input from state and local entities to the regional Project. The regional office developed mechanisms to solicit user involvement through needs assessment and interview techniques. The field structure also provided services for STD components including field-testing, public information support, data collection, equipment operation training, and evaluation activities.

REGIONAL PLANNING AND RESOURCE MOBILIZATION

REGIONAL

Discussions were undertaken with a variety of agencies, organizations, informal groups, and individuals to: notify each that the STD existed; inform them of its intentions and needs; request specific advice, assistance, and participation in the planning of the Demonstration; and obtain the official or informal sanction of the agency or person. Special efforts were made in the Planning phase of the STD to communicate with state agencies which had statutorially designated responsibilities for telecommunications, education, and social services.

GOVERNMENTAL CONTACTS

The states which were members of the Federation or which indicated early interest in participation in the STD are grouped under four regional offices of the U.S. Department of Health, Education, and Welfare: (1) Arizona and Nevada (Region IX, San Francisco); (2) Idaho (Region X, Seattle); (3) Wyoming, Montana, Utah, and Colorado (Region VIII, Denver); and (4) New Mexico (Region VI, Dallas). Communication with these Region offices was maintained by letter, telephone, and personal visits by the Field Services staff. The Deputy Commissioner of Region VIII, Denver, was involved from the earliest planning stages in the development of the STD organization, the program design, and the funding efforts. Staff members of all Region offices were alerted to the STD program plans and were kept informed by written updates and by participation in briefings and conferences. Region staff specialists in migrant education, adult education, and career education were the most frequent participants.

The Navajo Tribal Council, the United Pueblo Tribal Authority, the Southern and Mountain Ute Councils, the United Indian Tribal Authority, and other similar multi-state or multi-tribal agencies were briefed by STD personnel. Contact persons or offices within their organizations were identified and furnished the STD with demographic and organizational information.

The Federation, through the informal contacts of its president, a former Governor of New Mexico, kept the state executive offices abreast of STD needs and progress. Occasional briefings were given by STD staff to governors' aides. State education agencies became the host agency in six of the eight participating states. Through early contacts with chief state school officers and their staffs, additional meetings and briefings were conducted with state boards of education. The purposes of these early contacts were to:

(1) inform the state boards and agency decision-makers of the goals of the STD and its progress in organizational development;

(2) speculate on the alternatives of the state staffing needs of STD;

(3) request the state agencies' input concerning workable procedures for identifying schools for participation in the Project; and

(4) assist the agency in specifying its needs for particular operational procedures within which STD functions were to be conducted in the states.

Informational briefings were given to State Migrant Education Councils, the Offices of Economic Opportunity, the State Departments of Social Services, local Law Enforcement Assistance Act (LEAA) offices, and early childhood care agencies, where these were represented in the state governmental structure. Several state health department staffs were briefed. Frequent update meetings were held with federal agencies such as DHEW and NASA.

As a result of state education agencies' requests for funds for staff positions in the STD, it was necessary in several instances to brief state executive and legislative planning and budget personnel to help ensure the states' adequate funding response. The STD Field Service staff occasionally prepared generalized budget projections, state personnel specifications, job descriptions, and management plans for use by the state planning and finance offices.

In one participating state, the host agency was the Educational Communications Commission. Frequent meetings with its staff director and governing board provided planning data, negotiated staff employment, and cooperatively determined joint tasks and a time frame for their completion.

EDUCATIONAL CONTACTS

Additional briefings and progress reports were given to boards of cooperative educational services, state educational staffs, various county educational accountability committees, county-level career education staffs, the educational staffs of Regional Health Planning Councils, and Manpower Training Development personnel. Regional planning meetings were also conducted with local school administrators. Specific contacts with the Western Interstate Commission on Higher Education (WICHE) yielded the assistance of this agency, under contract, in planning the eight-state field structure. Visits to nine universities and two higher education commissions were made to discuss the feasibility of granting credit to participants enrolled in the STD's proposed in-service series, "Careers and the Classroom: A New Perspective for Teachers."

MEDIA CONTACTS

The STD Field Services staff visited the regional public television stations to describe the STD program offerings, broadcast schedules, communication relationships, state field structure, and local school operations. These meetings resulted in contractual agreements to broadcast certain STD programs under specified conditions during the operational year. Thirty radio and television appearances were made by Field Services staff to describe the Project's goals and activities. (See Technical Report TR0132: "Public Information: The Plan, Its Execution, The Results.")

Establishing a Field Services communications network was necessary in order to pursue other component tasks, since effective dialogue, planning, decision-making protocols, determination of legal restraints, and obtaining goal congruency were not possible without consistent and dependable communication channels. While the STD's Denver office was being developed early in the Project's Planning and Development phases, little could be done to establish a mature field network until an office or indigenous person responsible for communication with state and local agencies was identified. This step was partially accomplished by January, 1973, when all eight state coordinators had been employed and were on the job. (See Technical Report TRO333: "The Development of a Field Services Network for a Satellite-Based Educational Telecommunications Experiment.")

LOCAL PLANNING

Local Planning had its earliest beginnings at the time criteria were specified for the selection of sites. These criteria have been discussed in the section, "Criteria for Selection."

LOCAL SCHOOL DISTRICTS AND ATTENDANCE CENTERS

When local school districts had been notified of their selection as STD sites, the Denver staff concentrated its efforts toward providing current information to the administrators of the district. Principals, counselors, and selected staff members were briefed by administrative staff. Preliminary planning regarding amendments in school schedules to accommodate the STD broadcasts was begun in several instances, although broadcast times had not yet been confirmed. Only the general requirements of the career education teacher and site coordinator were known at this time. (See the section, "Selection and Responsibilities of Local Personnel.") The administrators alerted their governing boards about the general requirements of the STD, the expected costs to the district, and the operational details as they were known. Because the operational year was still 18 months away, site personnel could not be identified or selected by local administrators, although in several sites faculty members had expressed interest in such an appointment.

Financial planning by local school administrations was not possible except for budgeting for the purchase of a television monitor. Because a majority of those schools selected for participation had little previous experience in the area of television, their immediate concerns were with soliciting recommendations regarding the compatibility of site-purchased equipment with the STD receiving system.

At the time of site selection, programs were in the initial stages of content development and only the broad outline of the semester's course was available to the schools.

An important criterion established (prior to selecting sites) by Field Services and Research personnel was that participants should indicate a willingness to accept and carry out innovative practices. Site capabilities were evaluated by the Field Services staff on the basis of interviews with personnel at schools which had indicated interest in participation. Initial site selection was guided by these professional evaluations. Although the Field Services staff conducted a limited needs assessment to determine proposed television program content, neither the sites nor the STD attempted a formal needs assessment to determine: (1) knowledge of or experience in the use of classroom instructional media, specifically television; (2) planning, evaluation, or program management capabilities possessed by local districts; or (3) the existence of successful programs in school-community relations.

It was not until mid-summer, 1974, that broadcast schedules were firm. Only then were school principals able to finalize daily schedules. Occasionally, school bus schedules, as well as class schedules, had to be replanned. In several schools, class periods had to be lengthened; the school's activities program had to be rescheduled; or 1974-75 preregistration data had to be discarded and a new registration procedure devised.

Although a brief training program for state coordinators was conducted by the STD staff to upgrade skills in classroom media use, no formal plan was implemented for extending this training experience to local schools. Summer vacation schedules and budget reductions precluded carrying out a logical training plan. There is no indication that local districts inaugurated any formal mediated training program.

Specific responsibilities and stipends for the position of site coordinator were made final and communicated to participating sites in July, 1974. This represented the data needed by local administrators and staff to appoint staff personnel to the position and, consequently, to complete local staff assignments for the 1974-75 school year. In school districts in which there were staff vacancies until late summer, 1974, little staff planning was undertaken during the STD's formal pre-operational period. Most local planning, therefore, was in the form of a last-minute reaction to the needs of the STD.

LOCAL COMMUNITIES

Site coordinators, school administrators, and school staffs contacted service clubs, parent groups, and town or county governmental organizations, where these existed, to inform them of the goals and intentions of the Project. When additional, specific information was provided by the STD, the site coordinator kept these organizations informed. Because many of the sites were open country schools, they were not characterized by identifiable trade communities, and hence did not have the normally existing service organizations. Therefore, communication with the community became essentially the province of the school through the actions of the local site coordinator.

With the exception of providing all available Project information to school district patrons, little additional formal school planning could be done by the school administration. The planning activities of the local school community might be characterized as "community acceptance and willingness to participate." In no known case did the greater community participate in formal planning. It would be difficult, if not impossible, to rationalize community patrons' roles in planning for an elaborate technological effort covering eight states.

MOBILIZING RESOURCES

COMMERCIAL AGENCIES

As a result of ATS-6's reception pattern, northwestern Nevada could not receive satellite broadcasts. Reno and Carson City (the capital) could not be served. The State Educational Communications Commission, in which the state coordinator was located, made arrangements with the University of Nevada at Las Vegas to receive the satellite signal and relay it by microwave to the Western Communications Corporation (WCC), a commercial television distributor located in Las Vegas. The WCC then used its backup microwave system to relay the signal to the mountainous region near Reno where Teleprompter, Inc., a CATV company, distributed the programs to the Washoe County School District, serving the communities of Reno and Sparks, Nevada.

T. V. Pix, an Elko, Nevada, cable company, distributed the signal to several schools in the Elko region. Similarly, translator reception in Roundup, Montana, and cable company reception and distribution to the Wallace-Osburn communities in Idaho, were provided by private systems. (See Technical Report TRO335: "Experiences With Varied Terrestrial Signal Distribution Methods.") The White Pine Television District provided translator facilities to the Ely and McGill, Nevada, communities after receiving the broadcast signal via microwave from the Western Communications Corporation in Las Vegas.

DESCRIPTION OF THE FIELD NETWORK

The Utilization component, responsible for the organization, maintenance, and evaluation of the field structure, was comprised of a director, an associate director, two field service coordinators, and support staff. Occasional or part-time staff were also employed to assist in special tasks, e.g., the collection of demographic data, structuring information systems, analyzing legislative and legal provisions and constraints of the states, establishing communications with special ethnic groups, and locating state and community "helping organizations."

The external structure of the field network was located in each state's existing educational system and was staffed by a resident coordinator. The state coordinator was a full-time employee of the agency and was paid through funding provided by a grant from the STD. Although legally a state agency employee, the state coordinator's tasks were the product of contractual agreements between the STD and the state agency administration. Specific task direction was given the state coordinator by the Utilization component staff in Denver.

The Field Service network was completed by providing an on-site coordinator selected by the school administration in each of the 56 schools. This person, usually a staff member of the school, was, in all cases, indigenous to the site community and was known to be knowledgeable of the community's needs and its organizations.

RESPONSIBILITIES OF THE STD UTILIZATION COMPONENT

Utilization was responsible for ensuring optimum participation in the STD. To achieve this, the following component roles were identified:

1. **Spokesperson for the participating states and sites.** State and local conditions, needs, calendars of operation, institutional goals, statutory requirements, and abilities to perform in certain aspects of Project-related activities were relayed to STD management and other Project components by Utilization staff, who were familiar with local and state agency operations.
2. **Developer of resources.** Resources at the state, county, and local level were identified and used to support the sites in their efforts to make instruction meaningful and to obtain solid community participation in the STD.
3. **Planner of field network and field activities.** Being a participatory, user-oriented Demonstration, state and site coordinators became an integral part of the Planning function, to the greatest extent possible.

SELECTION OF STATE COORDINATORS

Field Service's organizational plans attempted to ensure that users would be involved in the planning of STD products and services. To accomplish this, an extensive state structure was created which received guidance and support from a small Utilization staff located at the regional STD office. The state structure was augmented by a local structure (site personnel) which served as a localizing unit.

It was decided that the tasks enumerated in the preceding section could best be accomplished by a state-based, full-time coordinator in each state. Because of the instructional nature of the Project, the decision was made to place state coordinators in state agencies, preferably state departments of education. The state coordinator had two primary roles: (1) to advocate state and local needs to the regional STD office; and (2) to promote acceptance of STD products by developing user participation in planning. Essentially, this dual advocacy role provided the foundation upon which the entire Project Field Services network was built.

Three options for funding the state coordinator position were discussed:

1. The state coordinator would be an FRMS employee and the STD would make a grant to the host agency to provide support services.
2. The state coordinator would be a state employee and the STD would make a grant to the host agency for the coordinator's salary and support.
3. The host agency and the STD would jointly subcontract for state coordinator services to a consortium agency.

Ultimately, a combination of the first two alternatives was used. Between late October, 1972, and early January, 1973, grants of $20,000 per fiscal year were issued to the states of Arizona, Colorado, Idaho, Montana, Nevada, and Utah which were to cover the state coordinator's salary, benefits, and office support. Salaries were established by the individual state's schedule criteria to assure consistency. The states also agreed to provide office space, telephone, clerical support, and other services. All costs which exceeded $20,000 were contributed by the participating states.

The state education agencies played a major role in hiring the state coordinators. Job descriptions and qualifications were discussed with agency supervisors who in turn identified three persons whom they felt were qualified for the position. Utilization staff interviewed the three applicants, and with the agreement of the host agency, made the selection. All eight state coordinators were employed by January, 1973.

The advantage of this staffing arrangement was that the position was incorporated in an ongoing agency. A potential disadvantage was the danger that line/staff relationships would become ambiguous among the state coordinator, the state agency, and the STD. Consequently, it was agreed that the coordinator was to be responsible to a state education agency supervisor and would be permitted to work on other state tasks, commensurate with time and STD responsibilities.

RESPONSIBILITIES OF STATE COORDINATORS

The state coordinator was responsible for all Project functions within the state, including coordinating the activities of all site personnel. Major responsibilities included:

(1) participating in the state's development, implementation, and evaluation system to accomplish the state STD goals;

(2) developing a system to promote audience use of STD products and services within the state;

(3) implementing a public information system at the local and state level within the framework of the STD and state public information services;

(4) participating in the development, implementation, and evaluation of a community involvement program conducive to the attainment of Project objectives;

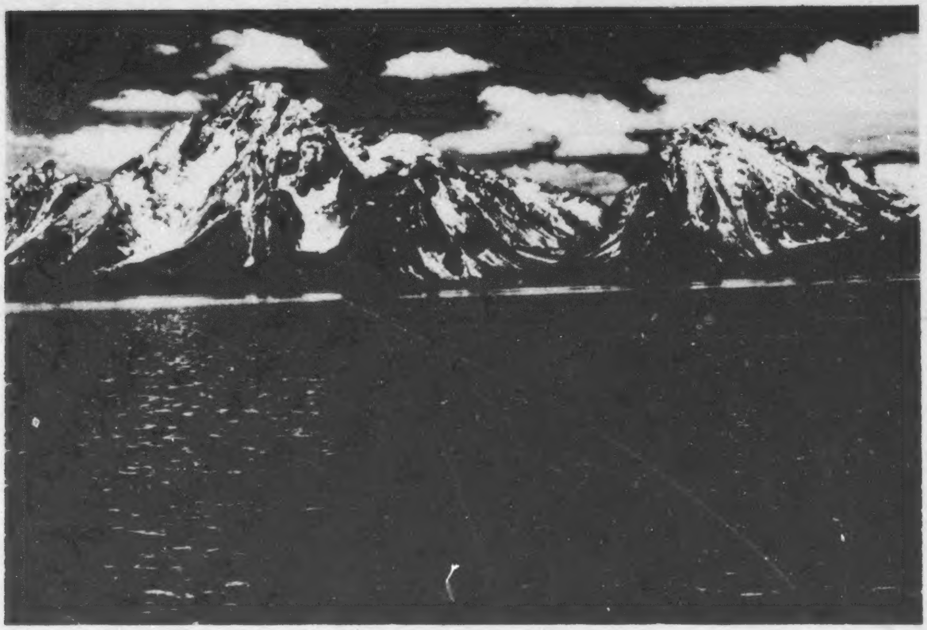
(5) coordinating the recruitment, training, and supervision of local site coordinators;

(6) assisting with product and process evaluations designed to assess the effectiveness of STD products and services;

(7) providing for the exchange of information among local, state, and regional participants to ensure mutual understanding of needs and goal accomplishments;

(8) reporting and providing information as needed; and

(9) establishing a liaison network between state agencies with similar objectives or with the potential for providing assistance to the STD project.



SELECTION AND RESPONSIBILITIES OF LOCAL PERSONNEL

SITE COORDINATORS

Criteria for the selection of local site personnel were developed jointly by regional, state, and local representatives. These criteria included:

(1) residence in the community;

(2) ability to communicate effectively with community organizations and individuals;

(3) sufficient time to accomplish the projected STD tasks (in Receive-Only Sites, at least two hours per day; in Intensive Sites, at least four hours per day); and

(4) a demonstrated ability to work effectively with site faculty and administration.

Assignment of responsibilities was determined by the organizational structure at the local school. Several alternatives were available to schools, ranging from an in-school coordinator with additional responsibilities, to an out-of-school coordinator with specific responsibilities for STD tasks. The site coordinator was the chief representative of the STD project within the community and was responsible for the coordination of all activities both within the local school system and throughout the total community. Responsibilities of the site coordinator included:

(1) providing public information within the framework of the STD public information services to the local community as directed by the state coordinator and regional staff, and conducting other activities which assisted in attracting and holding audiences for evening programs, Materials Distribution, and teacher in-service programs;

(2) operating the hardware for specific audience use as needed;

(3) collecting evaluation and other information as directed by STD;

(4) establishing and maintaining liaison with appropriate site agency personnel and conducting coordination activities within the framework of the site agency's policies and procedures;

(5) identifying, mobilizing, and coordinating volunteers;

(6) assisting in the field-testing of scripts, program segments, and printed support materials as directed by the state coordinator;

(7) participating in the implementation and evaluation of STD activities;

(8) arranging for proper storage and distribution of STD software; and

(9) conducting community liaison efforts as directed by STD.

CLASSROOM INSTRUCTORS

The career education classroom teacher was selected from among the ranks of available faculty members by the school administration. The teacher was assigned responsibility for integrating and coordinating the junior high school programming into the ongoing school curriculum. In most cases this assignment became an integral part of the regular classroom duties. In addition, evaluation tasks were assigned to the teacher and included:

(1) completing daily and weekly evaluation forms as directed by the STD;

(2) providing evaluation information to the local administration and, when requested by STD, to the state and regional STD offices; and

(3) making recommendations for improvement of career education products of the STD when requested.

Values
Plan

ADMINISTRATION AND SUPERVISORY PERSONNEL

The major role of the superintendents and principals of the participating schools was that of primary liaison with STD state and regional personnel. On this basis, superintendents and principals assisted and/or supervised site selection procedures, selection and training of site personnel, location of equipment installation, STD classroom placement, and schedule modifications. Administrative responsibilities were essentially those of sanctioning tasks and assignments in support of the STD. The school administrator was requested to furnish, upon request, in-kind and cash cost data for the STD's evaluation effort.

SITE SELECTION

Discussions regarding site selection were held with representatives of each state, beginning in early 1972. These representatives included the governor of each state, chief state school officers, and content and technical specialists. Extensive demographic data on the region were collected and reviewed. This data base provided a tentative list of over 500 sites from which the state school officers were asked to make their selection. The list was then modified on the basis of additional feedback from state department of education personnel, public broadcasting station managers, and STD's operating component staffs.

In the late summer and fall, 1972, the list of sites was revised to reflect the current availability of equipment and funding for site support activities. The list was again revised in December, 1972, reducing the number of sites to 248, and was submitted to the Interagency Radio Advisory Committee and the Federal Communications Commission for clearance of the sites as two-way communication sites. It was anticipated that a subset of these 248 would in fact be chosen as participants.

In December, 1972, letters of inquiry were sent to selected representatives of the 248 nominated communities. The letters introduced the Project, explained its broad goals, and invited the representatives to attend one of several informational meetings scheduled in each state. The meetings were attended primarily by school superintendents and principals, but several meetings were also attended by community representatives, school board members, curriculum directors, public television personnel, and staffs from boards of cooperative educational services.

The meetings, which were conducted by state coordinators and members of the regional Utilization staff, outlined in detail the technological capabilities of the ATS-6 and the objectives of the STD. After being given an opportunity to ask questions, participants were asked to indicate community interest in participating. All but one of the 248 communities represented at the regional meetings wished to be considered for participation.

The next step was for the state coordinators to visit each community which had indicated an interest in the STD. Using the following visitation procedures, each state coordinator:

(1) met with the school superintendent and members of the school staff;

(2) collected information about the school, including population demographics, school busing distances, classroom and other facility information, school schedules, and school experience in and plans for career education;

(3) visited with key community leaders, described the Project, and collected additional information about the community (including

community and county demographics, community commitment to education, driving time to metropolitan centers under good and poor road conditions, and media services in the community); and

(4) convened a public meeting which included a program featuring a tape/slide presentation about the STD, answered questions, and polled the audience with regard to the desirability of the STD for their community.

CRITERIA FOR SELECTION

Sites were to be selected as a distributed sample based on the following variables:

1. Geographic characteristics:
   - (a) metropolitan
   - (b) urban
   - (c) rural
   - (d) rural-isolated.
2. Ethnicity:
   - (a) Anglo
   - (b) Mexican American
   - (c) Native American
   - (d) Black.
3. Site and community interest in and commitment to the STD, as gauged by meetings and site visits.
4. Strength of local leadership.
5. Geographical location in the ATS-6 "footprints."
6. Financial resources.

On the basis of information from site visits, data collection, and major feedback from the state coordinators, the nominated sites were categorized into three prioritized lists:

1. Comprehensive Sites which were to have two-way audio, digital, and video capabilities;
2. Intensive (IT) Sites which were to have two-way audio and digital capabilities; and
3. Receive-Only (ROT) Sites which were to have receive-only capability.

PROCESSES USED FOR FINAL SITE SELECTION

Early in 1973, it was determined that the costs for originating video programs at the sites were prohibitive and also that the Interagency Radio Advisory Council (IRAC) would not clear 2.25 GHz frequencies except in the state of Alaska. Therefore, Comprehensive Site assignments were withdrawn. Sites originally prioritized as Comprehensive were moved to the top of the Intensive list, moving the lower ranking Intensive Sites to the top of the Receive-Only Site list.

A study was conducted to compare the costs of: (1) redesigning the ATS-6; and (2) using land-line communication for Intensive Sites as a possible alternative. The following conclusions evolved from this study: (1) It would be too costly to make the necessary frequency change to ATS-6; and (2) the employment of land-line communications was too costly for remote sites. While this study was being completed, the Broadcast and Engineering component determined that the ATS-3 audio frequencies could be used at minimum cost for rural, isolated communities since its use would not interfere with frequencies and services used by several commercial terrestrial users. With NASA's concurrence, the decision was made to utilize ATS-3 as the audio communications link between all Intensive Sites and Denver. It was necessary to obtain IRAC and FCC clearance for the sites which would be using the ATS-3. On March 30, 1973, notification was received from NASA that 24 Intensive Terminal sites had to be selected by April 5, 1973. To meet this new deadline, it was necessary to select tentative sites before all nominated sites had been visited, and consequently, without complete review of site selection criteria.

On May 11, 1973, a list of 69 sites was prepared, including the 24 Intensive Sites (cleared by IRAC), 16 Intensive Sites utilizing land lines, 16 remote Receive-Only Sites, 12 public television stations, and an installation at the University of Nevada at Las Vegas to be used in relaying the satellite signal to northern Nevada. As stated, original evaluation plans called for a sampling of sites from rural to metropolitan. A federal decision (NIE, HEW/OTP) however, directed that only rural and rural, isolated sites should be included. In addition, a new requirement, "non-redundancy," was added by the federal funding agencies to the site selection criteria, i.e., no site with adequate public television reception could be selected.

Because of these new criteria and the reduced budget, sites designated as "land-line Intensive" had to be dropped from the Project because they were located in areas with access to public television programming. Land-line sites were replaced with rural, non-redundant communities which would have receive-only capability. Thus, the final site list included 24 IT Sites, 33 ROT Sites, and 12 public television stations.

Plans for the negotiation of site agreements were formulated by state coordinators, and the final version of the site contract for each state was developed in modular form. Various levels of financial support were prepared so that contracts could be tailored according to individual communities. The final contracts were distributed to each state on September 15, 1973, and all site contracts were signed and returned to the Denver STD office by November 15, 1973. Final site selection results have been illustrated in Table 8.

TABLE 8
STD Sites

Arizona	Type
Hayden	IT
McNary	IT
Tuba City	IT
Fredonia	ROT
Gila Bend	ROT
Seligman	ROT
St. Johns	ROT

Colorado	
Meeker	IT
Monte Vista	IT
Montrose	IT
Antonito	ROT
Colbran	ROT
Craig	ROT
Naturita	ROT

Nevada	
Carlin / Ruth	IT
McDermitt	IT
Owyhee	IT
Battle Mountain	ROT
Elko	ROT
Ely	ROT
Winnemucca	ROT

New Mexico	
Cuba	IT
Dulce	[illegible]
Penasco	IT
Mora	ROT
Questa	ROT
Springer	ROT
Wagon Mound	ROT

Idaho	Type
Challis	IT
Lapwai	IT
McCall	IT
Osburn	ROT
Salmon	ROT
St. Maries	ROT
Vallivue	ROT

Montana	
Busby	IT
Colstrip	IT
Ft. Benton	IT
Roundup	ROT
West Yellowstone	ROT
Whitehall	ROT
Three Forks	ROT

Utah	
Blanding	IT
Enterprise	IT
Heber	IT
Hyrum	ROT
Kanab	ROT
Morgan	ROT
Panguitch	ROT

Wyoming	
Pinedale	IT
Riverton	IT
Saratoga	IT
Arapahoe	ROT
Dubois	ROT
Lovell	ROT
Sundance	ROT

Public Television Stations

KAET-TV, Arizona State University, Tempe, Arizona
KUAT-TV, University of Arizona, Tuscon, Arizona
KRMA-TV, Denver Public Schools, Denver, Colorado
KTSC-TV, University of Southern Colorado, Pueblo, Colorado
KBGL-TV, Idaho State University, Pocatello, Idaho
KUID-TV, University of Idaho, Moscow, Idaho
KAID-TV, Boise State University, Boise, Idaho
KLVX-TV, Las Vegas Public Schools, Las Vegas, Nevada
KNME-TV, University of New Mexico, Albuquerque, New Mexico
KENW-TV, Eastern New Mexico University, Portales, New Mexico
KBYU-TV, Brigham Young University, Provo, Utah
KUED-TV, University of Utah, Salt Lake City, Utah
KRWG, New Mexico State University, Las Cruces, did not participate because the station was located outside the eastern footprint.
University of Nevada at Las Vegas (not a public television station; used for signal relay only)

ACTIVITIES WITH SITES PRIOR TO BROADCAST

After the participating sites had been selected, state coordinators provided information and advice concerning: (1) contractual relationships; (2) expected needs for staff training; (3) identification of alternatively acceptable locations for receiving equipment and career education classrooms; (4) general criteria for the employment and use of the proposed site coordinator and career education teacher; and (5) developments regarding future use of satellites by social service agencies.

FUNDING OF SITE ACTIVITIES

The question of whether the site coordinator would be a school-based person or a person from the community-at-large was affected by the availability of funds. Intensive Sites were allowed $1,500 each for support of a coordinator; $900 was available to support a coordinator at Receive-Only Sites. These funds were to cover salary, travel, telephone, postage, and other supportive services. The Utilization staff and state coordinators perceived that ample funds were not available to attract trained technical support in the community to perform the required site coordination tasks.

Purchase of classroom receiving equipment (i.e., a television monitor and video cassette recorder) was to be made from school district funds. Providing supplementary classroom materials (i.e., general career education references, texts, and audio-visual media) was a local school responsibility. The Project supplied the research classes with student guides and teacher guides, print supplements which were tailored to the television programs.

CONTRACTUAL AGREEMENTS

Contracts specifying the responsibilities of the STD and the local school district were negotiated immediately upon the selection of sites. The initial contract period was for the fiscal year 1974. Contract extensions were later prepared for the operational year (fiscal 1975).

In all cases, employment agreements were negotiated between the STD and the site coordinators. The agreements specified dual supervision of the site coordinators by the state coordinator and the school principal. In seven states, contracts specified that grants be made to school districts which in turn reimbursed the site coordinators. In Arizona, state statutes prohibited local schools from receiving direct grants; therefore, site coordinators were placed on the STD payroll, with the employment contracts with those site coordinators specifying this condition.

In all states, contracts or letters of agreement were negotiated to specify the conditions of the use of STD programming by the public television stations.

DESIGNATION AND PLACEMENT OF EQUIPMENT

When the sites were finally identified, state coordinators and local school personnel determined the location for the receiving antenna. In addition, a classroom was selected which was educationally suitable for STD program activities and which met Project engineering requirements. The Broadcast and Engineering installation teams visited each school and installed outside receiving equipment and the wiring for the reception of the programming in the classroom.

ORIENTATION AND TRAINING OF SITE COORDINATORS

There were four formal training activities for state coordinators. In October, 1972, upon the employment of state coordinators, a training session was held in which plans were outlined for the succeeding months and the coordinator's role was specified. A planning format to accomplish major milestones within given time frames was used throughout the Project. State coordinator training sessions were conducted to discuss STD tasks and to plan the methods of communicating the needs of the Project to state and local personnel. After site coordinators were identified in spring, 1974, state coordinators visited each site and conducted comprehensive orientations. A less detailed presentation was made to the entire school faculty. The goal of these meetings was to ensure that the school was totally prepared to receive training on data collection and equipment operation and that personnel would be prepared to move directly into the Project upon their return to school in the fall. Thus, site orientation and training ("What I do," "what you do," "how we solve this or that problem") began as soon as sites were selected and continued throughout the life of the Project.

In early summer, 1974, state coordinators received intensive training in equipment operation and the use of classroom audio-visual media. The state coordinators later trained local site coordinators and teachers. In August, 1974, a region-wide pre-service training activity was conducted, involving all STD components. All site coordinators, several teachers, and other school staff in each state met with the state coordinator for three days at one of the state's Intensive Sites. During this time, 10 hours of satellite broadcasts from Denver, featuring the various STD components, were viewed and discussed. The remaining time was devoted to equipment operation and data collection training.

Between the end of the formative and the beginning of the summative semester, site coordinators again met in a central location in each state. Considerable time was spent in correcting data collection and reporting problems and generating changes for the second semester. Curricular and instructional ideas and Project experiences were shared.

COMMUNICATIONS PROCEDURES

One of the major constraints of the field service structure was the physical and functional distances among its regional, state, and local segments. It was necessary to communicate changes across five Project component areas and to distribute information about specific technical equipment to local site personnel. This management structure necessitated a system of communications which provided a consistent and accurate source of information, particularly in view of the frequent changes in goals, funding levels, and conditions of operation. Therefore, the Project standardized its field communications policies and procedures and designated the Utilization component as the source of all communication to and from the field. This ensured that all field staff received consistent and timely information.

USER INVOLVEMENT

The Utilization staff and field personnel participated with the other STD operating components in obtaining demographic data, conducting school and community needs assessments, studying academic and research recommendations and findings, and informally talking to state and community residents. The overriding purpose of these efforts was to ensure, insofar as was feasible, that the desires and needs of local sites would affect the content of the products and services of the STD.

JUNIOR HIGH SCHOOL PROGRAM SUPPORT

A career development survey, initiated early in 1973, included parents, professional educators, students, and business leaders. The survey's purpose was to furnish guidelines regarding the nature and grade level of the curriculum and the program format. This information provided the basis upon which to initiate program development. Once the outline of the program was established and scripts were written, each coordinator developed a state-wide script committee for the purpose of reviewing the scripts. Revisions of the scripts were based on this feedback from the field. Later, when enough program segments had been taped and edited into short program segments, they were field-tested with summer school students in the Denver metropolitan area.

IN-SERVICE PROGRAM SUPPORT

User involvement was encouraged for the development of the in-service training programs. Internal STD discussions revealed concern regarding the number of persons who might be attracted to the in-service programs, especially as broadcasts would be at the end of the school day when potential participants would be weary from the day's activities. It was determined that efforts would be made to obtain college credit for the participants. Credit would be of two types: (1) university graduate credit and (2) recertification credit through the states' departments of education.

Regional and state field personnel began contacts with state department of education recertification personnel and with colleges of education in the region. The purpose of these contacts was to explain the STD, particularly the intent and scope of the in-service program, and to receive credit-granting personnel's opinions about the suitability of the in-service program for credit issuance. Major concerns of the universities (prior to agreeing to granting in-service credit) included the qualifications of the presenters, the activities which would integrate the series of lectures into a sequential program, and the nature of any print support materials which would be available for use by the participants and the supervising professor.

Intensive interface between the state coordinator and university personnel resulted in arrangements for granting of credit. When these arrangements were finalized, contacts were made with the sites by the state coordinators to seek the support of the local administration for the in-service programming and participation by teachers.

EVENING ADULT SERIES

Plans for the evening adult series experienced considerable change due to suggestions received from the field. During visits to the various sites in fall, 1973, a random sample of adults was interviewed to discuss a proposed evening program. The purpose of the interviews was to ascertain the interest in certain topics, the frequency of programs which would be supported at the local sites, and the potential audience. In addition, program suggestions were solicited from local school personnel.

MATERIALS DISTRIBUTION SERVICE

In November, 1973, the Materials Distribution Service was added to the STD programming by NIE. This late addition required visits by regional and state staff to each site to inform them of the nature of the service; distribute film catalogs and discuss the film selection process; define the role of the users in selecting the films which would be broadcast; emphasize that the program would be available for all subject areas and for all grades; and discuss the necessary equipment purchases by the sites.

SITE ACTIVITIES AND SUPPORT DURING ACTUAL PROGRAMMING

FUNDING

STD stipends for site personnel remained unchanged during the period of program transmissions (August, 1974, through May, 1975). Sites contributed in-kind (i.e., existing staff, facilities, and services) and cash support for the effective consumption of STD products and services. For example:

1. Teacher and student guides were purchased by many sites for use by classes in addition to those materials provided the research groups.
2. Additional videotapes were purchased by the sites to archive the junior high school programs for later use and to participate as fully as possible in Materials Distribution programming.
3. Meetings with STD personnel, community groups, and visitors were arranged by local site personnel, frequently using school or rented facilities.
4. Extra library resources were often acquired to improve school library selections in career education and space communications technology.
5. Additional classroom instructional materials were purchased to better meet the instructional requirements of the career education programming.

ACTIVITIES REQUIRED

Most necessary operational activities were common to all programming areas. The local site personnel were responsible for preparing the equipment at the site for the reception of STD programming (i.e., turning the equipment on, making the necessary readings and adjustments, and completing the daily data forms required by the Network Coordination Center. The site person in charge then had the responsibility of preparing the class or adult group to view the program and of conducting other activities which enhanced the television program. In addition, teachers were responsible for implementing suggestions found in the teacher's guide and in the student handbook. It was the responsibility of the teachers or group leaders to localize the program by planning follow-up activities which would take advantage of various community resources. At the conclusion of the program, the teacher or group leader was responsible for obtaining evaluation reports from the viewers. For those teachers and site coordinators in Intensive Sites, there was the added responsibility of preparing themselves and their group for audio interaction via the ATS-3.

Site personnel were also asked to provide feedback on a **Weekly Site Report** form on which each of the programs was rated. For the junior high school career education program, this was a daily responsibility.

The junior high career education programming recommended the acquisition and use of additional classroom instructional materials, e.g., local employment office pamphlets, the **Dictionary of Occupational Titles,** and assorted human and manufactured resources.

The in-service programs made additional demands on school personnel. Liaison with college and university field service personnel from the credit-granting institutions was a necessity. Distribution of teacher course guides and bi-weekly updates on forthcoming in-service lessons were required. Faculty members had to be reminded of class sessions; program evaluation instruments had to be administered; and attendance records for school administration and credit-granting agencies had to be kept. These operations were all part of the bi-weekly routine. Frequently, local school schedules prevented the use of live broadcasting and, in such cases, the site coordinator arranged to tape the in-service lesson for replay at a convenient time.

Evening programs for adults required the site coordinator to publicize the program by placing leaflets, supplied by the STD, in business establishments, on automobiles, in shopping bags, or in utility bill envelopes. Posters were displayed in popular gathering places. News stories were prepared by local or nearby publishers with the help of site coordinators. Frequently, a trip to a larger community to arrange for a radio or television public service announcement was advisable. Often a series of telephone calls was made by the site coordinator to generate a reminder system of forthcoming satellite television programs.

The Materials Distribution Service programming required the extensive taping of transmissions received during or immediately prior to the school day. In schools which had obtained a large supply of tapes, an elaborate cataloging system had to be devised to arrange and display the taped programs for convenient use, a system which required the assistance of the librarian. Informing faculty members of program titles and transmission time and making arrangements for use of the available videotaping equipment was a difficult logistical problem, particularly if the school district's attendance centers were widely dispersed. Obtaining teacher requests for additional Materials Distribution titles, collecting their requests, and transmitting these to the STD regional office were regular events.

SUPPORT OFFERED AND USED

Although much of STD's support to the sites was embodied in the video programming, the following examples of requested and provided support illustrate the STD's contributions to localizing or supporting other products or services:

1. Troubleshooting was provided when a problem with equipment location or functioning persisted. Normal failure reporting channels were sometimes perceived as inadequate, particularly in cases of television monitor or videotape recorder problems.
2. Occasionally, schools needed to deal with manufacturing, sales, or service agencies and in these cases advisory support was provided.
3. Speaking engagements were scheduled to inform state and local boards of education, teacher groups, and community service clubs about the STD.
4. Progress reports and programs featuring the STD were presented to various educational conferences such as meetings of state principals or administrators.
5. When necessary, Field Service personnel obtained and transmitted answers to requests for information by site personnel — answers which could be provided only by specialists in other operating components.

PROMOTING PUBLIC AWARENESS

PURPOSE OF THE STD'S PUBLIC INFORMATION EFFORT

The Satellite Technology Demonstration's public information effort was designed to promote awareness and acceptance by the Project's many constituencies through a strategy of presenting clearly, moderately, and objectively what the Demonstration intended to accomplish and what actually occurred. Informing the various publics in understandable terms would allow opinion leaders to accept (or reject) the new technology and to translate its potential to future needs and applications. Furthermore, a flow of accurate information was vital in a project having the newness, complexity, and scope of the STD.

The Project's Public Information staff — responsible for designing, initiating, and maintaining the flow — operated as part of the Project's Administration component. Management guidance was available when needed, but PI personnel had all the freedom of action and the flexibility necessary to meet changing requirements and opportunities.

THE PUBLIC INFORMATION PLAN

The public information plan identified five audience categories: local, state, regional, national, and international. Each group contained several diverse audiences having distinct characteristics, needs, and degrees of familiarity with the Demonstration, media, technology, and programming. A conscious decision was made to emphasize local and regional public awareness during the operational period because of the regional nature of the Project. No formula was established to distribute the staff effort and the PI funds in specific quantities to service the five levels or audiences, all of which were important and required attention. The Public Information staff worked with the four STD components and Administration to create a solid base of information to be disseminated to the Project's many audiences.

Specifically, the STD PI plan entailed:

(1) designing and scheduling information dissemination at all five levels;

(2) monitoring and filling requests for Project information and services;

(3) designing information strategies for various STD audiences;

(4) coordinating STD public affairs activities with other Health, Education, Telecommunications Experimenters and agencies;

(5) developing public information materials such as brochures, displays, media shows;

(6) striving for in-depth coverage of STD activities in various media; and

(7) serving as STD spokesperson at conventions, symposia, and other gatherings.

To accomplish these tasks, three phases were identified. The first (from July, 1973, to March, 1974) was used to create an awareness of the Demonstration. The second phase (March to September, 1974) covered the pre-launch and launch of the ATS-6 as well as its operational testing. Activity in the second phase was designed to take advantage of the interest in this new kind of communications satellite and its future potential. The third period (September, 1974, to July, 1975) covered the operational life of the STD. During this period, public information was geared to the Project's day-to-day operations. The PI plan was part of an overall Project and multi-state effort to promote public awareness. At the state and local level, state and site coordinators developed plans compatible with the STD public information plan. State plans reviewed by the PI staff in Denver provided numerous suggestions and techniques for use throughout the eight-state region.

The use of consultants and outside production units was necessary because of the small staff (two people) assigned to PI and because of the need for production and distribution of materials with short lead-time notice. There was limited use of these outside resources because of budget constraints.

RELATIONSHIPS

Coordination of STD public affairs activities with federal agencies and the other five Health, Education, Telecommunications (HET) Experimenters was accomplished on an "as needed" basis. There was no formal structure or pattern of regularity in the STD's public information contacts with these external organizations, nor was there an exchange of information on an independent basis. The PI function, staffing, and budgets of other Experimenters were never identified for the STD. The intra-project contacts were not particularly valuable in furthering the STD public awareness effort. The PI staff seldom took the initiative in contacts with their counterparts in other Experiments, but were always responsive to inquiries from individuals working for ATS-6 related organizations. Coordination of the HET public information efforts was not assumed by NASA headquarters; however, they did provide assistance when requested. The flow of material between the two organizations was mutually supportive.

The relationship between the STD PI staff and the Federation PI officer was not integrated, although a channel of communications was established. Cross-checking of information disseminated by other STD or Federation personnel assured consistency and continuity.

During the last half of calendar year 1973, production of public information materials such as brochures, displays, and media shows was initiated. This effort continued throughout the Project, with updating, revisions, and additions requiring major amounts of staff time. In-depth coverage of STD activities, however, was not accomplished during the Project. Though much was written and reported about the STD, the in-depth coverage sought from national media (print and electronic) did not occur.

Requests for appearances of STD personnel at conventions, symposia, and other gatherings increased in the post-launch and operational phases of the Project, and staff were encouraged to participate in such meetings.

A working relationship with the Project components was essential for the PI staff. A close arrangement was established with Utilization as a result of that component's responsibility for the field communications network. Discussion with state coordinators during meetings in Denver in August, 1974, resulted in assurances that there was field support for the Project's public information plan. Additionally, state coordinators identified user needs at rural schools for PI material. The field network communication plan required that material, with few exceptions, be sent to media in the region via established Utilization channels.

CLOSE-OUT ACTIVITIES

The Field Services network developed operationally into a complex web of regional, state, and local agencies and institutions as well as the personnel who represented them. Consequently, Project close-out activities reflected a continuation of these relationships beyond the date on which programming terminated.

STATE GOVERNMENT AGENCY LEVEL

Close-out activities at the state level included the completion of field activities and follow-up contacts providing for STD compliance with the NIE contract and assurance that a maintenance and continuation mechanism would be in place for subsequent efforts. Close-out activities included:

1. Debriefings and final reports from each state coordinator regarding the STD experience in the state.
2. Debriefings of key state-level contacts to determine involvement and impact of STD respective to the state agencies.
3. Transfer of STD activities to the sponsoring state agency.
4. Liaison activities with STD successor programs within the state and region and with other projects related to the STD.
5. Correspondence with participating state agencies (including submission of reports, termination of present operational contracts, and letters of acknowledgement) was completed.

MEDIA GROUPS AND AGENCIES

State and regional staff interfaced with the regional public television stations regarding plans for future use of STD-developed materials. A report on the arrangements and communication with cooperating media groups and agencies was prepared. Arrangements for the Federation's Telecommunications Council and the Public Service Satellite Consortium (PSSC) to maintain ongoing communication with interested media groups and agencies for subsequent efforts were made. Negotiations were completed with media production agencies regarding copyright clearances for existing materials used in the STD.

LOCAL SITES AND COMMUNITIES

The maintenance and continuation aspects of the STD were an integral part of close-out activities at the local level. Such activities included the following:

1. Regional and state staff conducted debriefing visitations to each site, including discussions with the site coordinator, career development teacher, school administration, and occasionally, local board members.
2. Reports were solicited from local sites regarding the impact on the site from:
    - (a) visitors observing STD programming and the school's involvement in it;
    - (b) STD data collection efforts; and
    - (c) external evaluators' data collection efforts.
3. Regional and state staff provided an interface with local agencies regarding disposition of the STD equipment installed at sites.
4. Final reports were prepared using feedback from local and state participants on the operation of the STD in each site.

PROGRAMMING AND RELATED SERVICES

User involvement guided the production of all STD programs and materials through selection of initial "career concepts," field-testing, and production of all final programs and related materials. The specific purpose for producing all STD programming was to test the acceptability of these user-designed materials with rural audiences throughout the Rocky Mountain region.

The audiences (and the identified emphasis for each program) included the junior high school student audience (career education: "Time Out"), school staff audience (in-service training: "Careers and the Classroom: A New Perspective for Teachers"), and adult evening audience (topical programs stressing regional problems: "Footprints"). With the establishment of the Materials Distribution Service, another audience was identified: a general school audience which would have access to a library of educational films. All of the above were delivered via satellite.

IDENTIFICATION OF AUDIENCES AND PROGRAM AREAS

DESIGNATION OF MAJOR PROGRAM AREAS

Once career education had been selected as the primary content area, Project staff conducted a thorough search and review of existent programs and related resources. Plans were formulated to develop career education programs for K-12 students. However, because a series of spring, 1973, meetings with leading Rocky Mountain educators indicated that seventh-, eighth-, and ninth-grade students were the most neglected in existing career education programs, this group (usually referred to as junior high school students) was chosen as the primary audience.

The STD developed 28 "career concepts" synthesized from program objectives/content topics which had been derived from staff and field meetings. The concepts were submitted for field review in the fall, 1973. The sample population (235 teachers, 110 counselors, 147 administrators, and 326 parents) which rated the 28 concepts agreed that each concept was important and addressed urgent adolescent (7th, 8th, 9th graders) needs.

At the time the content assessment was conducted a sample of the primary user population was also taken, representing all eight states. The population of 2,578 adolescents had a mean age of 14.7 years. Each student was asked to respond to items in the following categories: (1) interests relating to various kinds of work; (2) attitudes towards different kinds of work; (3) knowledge of occupational alternatives; and (4) personal preferences toward reading materials, music, and free-time activities. The results of this assessment were used to identify appropriate television formats for the series by providing data concerning the effect of age, sex, grade, and ethnicity on student preferences.

IN-SERVICE PROGRAMS ON CAREER DEVELOPMENT

A series of programs ("Careers and the Classroom: A New Perspective for Teachers") was developed to supplement the junior high career education series and to provide an additional service to participating sites. It was hoped that the programs would be helpful to every educator at all grade levels in participating school districts. Concurrently, an investigation of the possibility for granting college credit and/or recertification to participants of the series was undertaken by the Field Services staff.

ADULT AUDIENCE PROGRAMMING

Field Services personnel collected information concerning potential community interest in adult audience programming dealing with topics such as land use, child development, alcohol and drug abuse, consumer affairs, and western heritage. Although somewhat interested in the concept, community representatives expressed reservations about the ability of any series to achieve total community participation.

MATERIALS DISTRIBUTION SERVICE

In mid-1973, the National Institute of Education (NIE) requested that the STD obtain a library of educational films and videotapes for transmission to participating schools. On November 14, 1973, the NIE and the STD entered into a **Memorandum of Understanding,** which established MDS. The document required the creation of a library and a descriptive catalog containing 300 titles spanning a variety of subject areas and for different grade levels. These films and videotapes were to be transmitted to the schools 120 minutes per week.

PRODUCTION ORGANIZATION AND DEVELOPMENT PROCESS

DESIGN AND INSTALLATION OF STUDIO PRODUCTION FACILITY

Original STD plans specified the transmission of more than 400 hours (200 per "footprint") of programming in early childhood development and career education to the Rocky Mountain states. Several potential sources for production of the program material were investigated to determine the need for an in-house production facility.

This survey, directed toward regional commercial and educational film producers, proved that the STD requirements would exceed their production capabilities: The region's public television stations could produce only 20 new hours of filmic materials and the cost of this film production ($1,000 to $1,200 per minute) was prohibitive. Existing filmic materials relating to the subject area were also reviewed as sources of programming; with few exceptions, they were out-of-date, did not reflect the necessary educational concepts, or were too costly.

As a result, an in-house capability to produce a sufficient quantity of cost-effective, quality television programs was justified and therefore, the decision was made to develop an STD production television studio. The requirement for live interaction reinforced this decision.

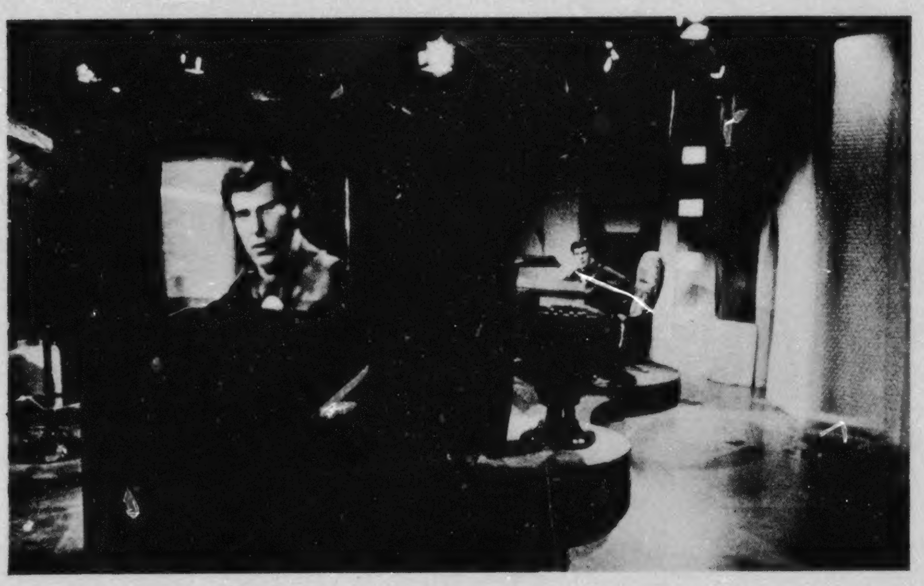
STUDIO LOCATION

Several studio locations within microwave reach of the transmitter were surveyed. While a number of these met the requirements, the building already occupied by the STD was selected as the most cost-effective location. Approximately 8,000 square feet of unoccupied space were available on the ground level. The studio and associated facilities (including the Network Coordination Center for the STD and the Origination and Delay Center of the Rocky Mountain Corporation for Public Broadcasting) eventually occupied 6,500 square feet. Space allocated solely for production, equipment, maintenance, and talent totaled 5,500 square feet.

PLANNING THE FACILITY

Contracts let to remodel the space included lowering the floor for increased ceiling height (to accommodate lighting) and installing the necessary electrical and air conditioning equipment. A management contract with the prime contractor provided coordination of all subcontractors' work. Assessment of electrical power requirements was made and an electrical design consultant wrote specifications for potential bidders. The production and engineering staffs of the STD developed a set of specifications for air-conditioning which defined acceptable noise levels and the maximum BTU's of heat which should be maintained.

The studio was ready for production in February, 1974, approximately six months after contracts were let. This late completion date resulted in much shorter lead time than was desirable for the planned pre-production of the program segments. Production segment output was maintained at a rate of 6 to 10 hours per day with frequent overtime; the last program in the junior high series was completed December 6, 1974.



QUALITY CONTROL

Since the signal quality of the STD picture and sound would be compared to the best commercial television network signal, a TASO 1 image was required. (A TASO 1 signal has no noticeable picture degradation and would be rated excellent by the most discriminating viewer.) All equipment purchased was of commercial broadcast quality.

EQUIPMENT ACQUISITION

By January, 1973, production equipment specifications were written and included: three studio color cameras, film-slide chain, three two-inch quadrature color videotape machines, time code VTR editing equipment, character generator, audio system, studio lighting, and associated switching, monitoring, and control equipment. Proposals received from five suppliers ranged from $630,000 to $700,000.

In June, 1973, the STD located a package of commercial broadcast-quality production equipment which was available for lease from the Levitz Furniture Company in Phoenix, Arizona. Inspection, inventory, and negotiations resulted in the leasing of this package for 24 months at approximately 45 percent of its market value, with the option to purchase upon termination of the lease. A film-slide chain, character generator, and a studio lighting system were purchased for $120,000, and the installed equipment package equaled the quality of any commercial television studio or production facility in the region.

Some equipment deficiencies were corrected during the early part of production. Three color cameras were leased to replace those in the original package which did not meet the quality standards of the rest of the equipment and could not be rebuilt in a reasonable time at an acceptable cost. Other than what would be considered normal "shakedown" changes, the equipment performed admirably during the Project.

PERSONNEL

The number of staff employed during most of production was minimal for Project requirements. Personnel included: program director, executive producer, operations manager, television directors (2), design artist, staff artist, audio technician, cameramen (2), lighting director, chief engineer, video technician, videotape operator, videotape editor, maintenance engineer, floorman, and production assistant.

COURSEWARE TEAM APPROACH

Standard television production organization did not meet the STD's programming needs, as content and format were interwoven so closely that separation of personnel functions was not feasible. A review of alternative systems led to an analysis of the "course-team" concept developed by the British Broadcasting Corporation (BBC) and the United Kingdom's Open University. Under this system, a committee composed of educators meets regularly, perceives curricular needs, and determines necessary courses. These courses are then assigned to separate course-teams composed of researchers, writers, and content specialists under the leadership of an educator-television director. The teams report progress to the committee for approval or disapproval. A BBC representative attends committee meetings to offer technical counsel and suggestions. In this operation, content objectives are the responsibility of the committee, which makes decisions concerning program content and format. The role of Research is to provide the committee with insight about audience needs. Once assigned a project, the course-team works separately from teams engaged in other projects.

Although the "course-team" concept offered a workable alternative to standard production procedures, an adaptation was necessary for the STD whose commitment to user involvement needed to be reflected in the production organization. Furthermore, the isolated and time-consuming aspects of individual course-team reliance on written feedback from an educational committee was not flexible enough for the STD's need for continual user and staff input. Another disadvantage of the BBC course-team procedure was the lack of opportunity for crossover interaction (cross-pollination) between teams. Therefore, an organizational structure called the "Courseware Team Concept" was designed to meet the STD's need for a merger of educational and production talents receptive both to user involvement and to feedback from other components.

The involvement and participation of staff members from all STD components was desired to satisfy the Project's three major programming responsibilities: (1) the design and development of content-specific programs; (2) the production of those programs; and (3) the development and production of print support materials.

Within the Program component, courseware team organization consisted of two teams or units, each headed by a unit director responsible for the team's program output and for directing the finished product. (The unit directors were also involved in the selection of talent, the design and construction of studio sets, and the "shakedown" of the studio facility.)

In addition to the unit directors, each team consisted of an experienced educator (content generalist), two script writers, and a clerk-typist. The organizational plan also provided for a pool of support specialists ready to reinforce and interact with both teams. This pool was staffed by a third content generalist; a print media specialist; a script editor, who also served as programming assistant; a reference specialist; and two artists.

The combined objectives of content and production were fulfilled by two people: an executive producer and a content coordinator. Their joint leadership responsibilities included guiding and approving the design and development of programs. The executive producer was responsible for approving the visual treatment of a program segment, integrating the program segments into a uniform format, and maintaining production standards. The content coordinator evaluated content interpretations for integrity, accuracy, and consistency.

The courseware teams met frequently to discuss objectives and to share information. Majority agreement approved format, vehicles, and characters. Once the content and general production treatments were in place, the units began the production of scripts. Initially, program segments were tested as prototypes in the field.

THE FORMATIVE PROCESS: DEVELOPING PROGRAMMING IN A USER-BASED SYSTEM

The formative process implemented by the STD in the development of the student series, "Time Out," involved 16 sequential steps. Organizationally, the 16 steps clustered in 4 categories: (1) identification and development of content (Steps 1-3); (2) development and refinement of scripts (Steps 4-8); (3) production and refinement of programs (Steps 9-13); and (4) refinement of television programming during the operational period (Steps 14-16).

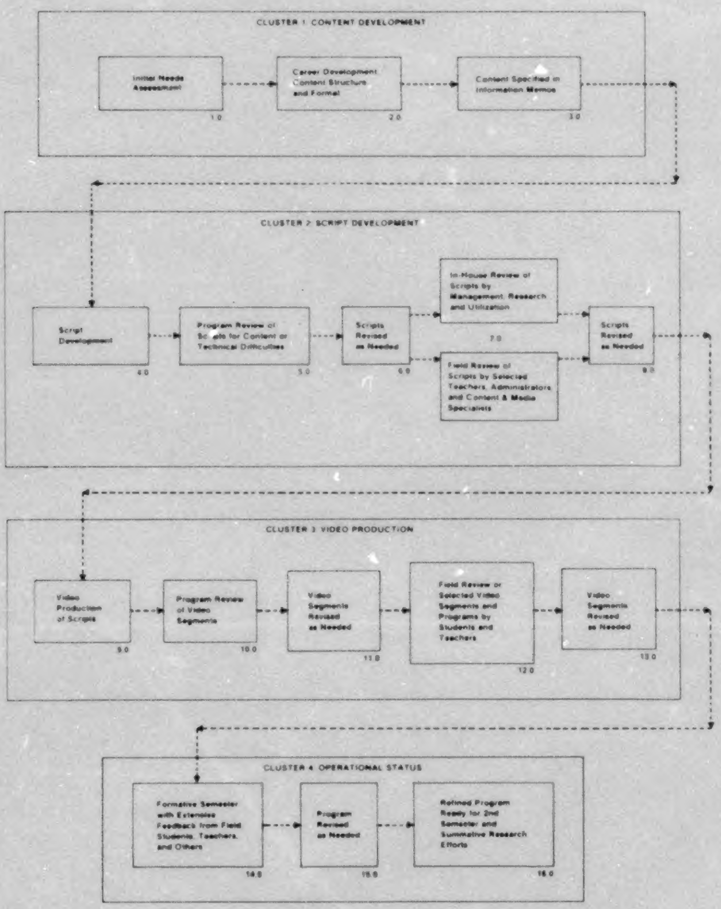

CLUSTER 1 CONTENT DEVELOPMENT
Initial Needs Assessment
1.0
Career Development Content Structure and Format
2.0
Content Specified in Information Memos
3.0
CLUSTER 2 SCRIPT DEVELOPMENT
Script Development
4.0
Program Review of Scripts for Content or Technical Difficulties
5.0
Scripts Revised as Needed
6.0
In-House Review of Scripts by Management, Research and Utilization
7.0
Field Review of Scripts by Selected Teachers, Administrators and Content & Media Specialists
Scripts Revised as Needed
8.0
CLUSTER 3 VIDEO PRODUCTION
Video Production of Scripts
9.0
Program Review of Video Segments
10.0
Video Segments Revised as Needed
11.0
Field Review of Selected Video Segments and Programs by Students and Teachers
12.0
Video Segments Revised as Needed
13.0
CLUSTER 4 OPERATIONAL STATUS
Formative Semester with Extensive Feedback from Field Students, Teachers, and Others
14.0
Program Revised as Needed
15.0
Refined Program Ready for 2nd Semester and Summative Research Efforts
16.0

FIGURE 10
THE FORMATIVE PROCESS

CLUSTER 1: CONTENT DEVELOPMENT

Step 1: A needs assessment conducted with state education officials, local school personnel, and junior and senior high school students provided information about student interests and generated educational goals for the series. **Step 2:** The second step involved the delineation of a content structure and the identification of appropriate television formats and delivery vehicles. At this point, three major content areas (self-assessment, career exploration, and decision-making) were identified. **Step 3:** The content of the series was organized into programs and program segments. Using a spiral approach, topics were distributed across programs so that every important concept would be re-examined. At this stage, the content generalist prepared an information memo — a working paper for other team members. It identified the objective(s) of the program, provided information about the content of each objective, listed the existing material available on the topic, and referred to other programs which related directly and indirectly to the program's objective(s).

CLUSTER 2: SCRIPT DEVELOPMENT

Step 4: The courseware team then met for a script design meeting which established general time allocation and storyline for a program's segments. These designs were submitted to the executive producer and content coordinator for preliminary approval. Working with the team's content generalist, the writer used the design to script an entire program. This rough-draft script also listed character, set, property, and technical requirements for production. **Step 5:** The script was then reviewed by all members of the programming staff. When time permitted, staff meetings were held to collect reactions; at other times, personnel communicated suggestions to the script editor. **Step 6:** A revised copy of the script reflecting this input was prepared for wider distribution and reaction. **Step 7:** Concurrent script reviews were made by other Project personnel, field reviewers, and a consultant. One review enabled STD Management, Research, and Utilization staff members to exchange suggestions. Another was conducted by a sample selected from a panel of 72 people (9 per state), consisting of junior high school teachers, counselors, and administrators; career development and media specialists; and representatives from public television stations in the region. In addition, Dr. H.B. Gelatt, a consultant to the Project and co-author of a series of materials on decision-making published by the College Entrance Examination Board, reviewed all scripts in which the content related to decision-making. **Step 8:** The data collected from these reviews were included in subsequent script revisions. After approval by the executive producer and content coordinator, scripts were labeled "approved for production."

CLUSTER 3: VIDEO PRODUCTION

Step 9: Program segments were videotaped. **Step 10:** Segments were reviewed for content and technical quality. **Step 11:** Those necessary revisions which could be accomplished by editing were made. **Step 12:** After this review and revision, prototype segments were tested with selected rural and urban students and teachers. **Step 13:** Due to production schedules, extensive modifications were not possible. However, this process affected segments yet to be produced and provided general acceptance for the program style and content.

CLUSTER 4: OPERATIONAL STATUS

Step 14: Because "Time Out" was a one-semester series, the first semester was used as a formative semester, and revisions were planned for second semester. Data was assembled to determine program acceptance as well as the need for program revisions. An in-house content and technical review was also conducted which examined program and segment quality and suggested alternatives. The information obtained from this review was correlated with student and teacher feedback whenever possible. (See Technical Report TR0213, "The Contribution of an In-House Review Panel to the Development of Educational Planning.") **Step 15:** Few revisions occurred between the two semesters. Production quality was improved (in the areas of film narration and segment transitions) and two characters who received negative student reaction were modified. **Step 16:** These revisions were incorporated in the second semester broadcasts of the "Time Out" series. (See the Technical Report TR0210, "The Formative Process Used by the Satellite Technology Demonstration in the Development of Programming for Junior High Schools.")

SPECIFIC PROGRAM DEVELOPMENT

THE J-SERIES CAREER DEVELOPMENT FOR JUNIOR HIGH AUDIENCES

To structure the content of the series objectively, a nationwide examination of existing career education projects was undertaken. Analysis revealed that all conflicted to a degree with one another and with existing career education plans of the participating STD school districts. The Project staff selected resources and organized structures which would meet user-accepted career concepts.

CONTENT DEVELOPMENT

The **Dictionary of Occupational Titles (DOT),** a United States Department of Labor publication, was adopted for STD use. The **DOT** divides all occupations into nine categories, describes the work performed in each identified occupation, and delineates the aptitudes, interests, and temperaments associated with each occupation.

The final revision of the original career concepts contained 28 major topics organized into three categories (self-assessment, career exploration, and decision-making). These three categories were complementary and process oriented; each process, however, relied on information. Assuming that each viewer-learner was a unique person, and believing that the content categories should assist each learner in improving his or her future, a variety of television vehicles and characters were developed to present the major topics. The organization of these vehicles and characters into program segments encouraged eclectic approaches to learning activities. Neither inductive nor deductive treatments were used exclusively; strategies illustrating discovery as well as fact acquisition [illegible] utilized.

In organizing the topics into program segments and programs, a spiral approach was designed and implemented. The spiral ensured that major topics would be treated more than once, that topics would build upon one another, and that each topic would contain both formal and informal references to others. Thus, activities were structured through a spiral built into each program. These activities emphasized the three major categories (or developmental processes) of self-assessment, career exploration, and decision-making. (An example of the spiral's process through the series is movement from the known to the unknown, as perceived by the learner.) Appropriate to the spiral design, the first week of programming focused on self-assessment, and the first **DOT** category examined (Farming, Fishery, Forestry, and Related Occupations) was judged to be the one most familiar to the audience.

PROGRAM PRODUCTION

Pre-production planning began during studio modification and equipment acquisition. With the selection of a futuristic setting called "Time Control Central" (TCC) as the format for the "Time Out" series, set design began. The University of Colorado Department of Theatre contracted for and constructed the TCC set. All other sets were designed and constructed by Project personnel.

The search for and selection of talent to be used in the series also began in the fall, 1973. Phone and mail contacts were made with all Denver-area talent agencies, universities and theatres, private dance and theatre companies, and drama teachers in nearby junior and senior high schools. Once auditions began, the actors and actresses told others about the Project. Nearly 300 people auditioned. The talent selection process involved an initial audition, call-back auditions, and videotaping of talent before final selections were made. The TCC actors and two other characters were placed under continuing contract. The remainder of the professional talent were signed for limited, specific program segment roles. STD staff members also acted as talent by making appearances in the series.

A professional costumer designed and produced TCC costumes; other costumes were rented from commercial establishments or were provided by the talent. Properties required in a particular script were generally obtained from Project personnel. Other properties were purchased or rented, especially if they were to be used frequently. Make-up was done by talent.

Art work and slides for each program segment were designed and produced by the art department, following guidelines from the script requirements. Photographs for stills were taken by several staff members.

The 6- to 10-hour per day production schedule precluded extensive rehearsal. The directors seldom discussed character delineation or delivery with the talent; cast members worked with one another during informal rehearsals, which usually focused on technical and blocking run-throughs.

Videotaping proceeded in cycles based on the settings of sequential program segments. For example, all TCC segments in the first 20 programs of "Time Out" were taped during a three-week period. This schedule made maximum use of the facilities but was exhausting for the talent and crew. All necessary artwork, slides, and existing material were to be videotaped along with the program segments, but this procedure was not always possible and led to complete reliance on extensive post-production editing.

Similarly, narrations or additional audio requirements which were scheduled to be videotaped at the same time as the program segment were often done in post-production.

EXISTING MATERIALS

Film and videotape materials comprised 20 percent of the prerecorded programs and enhanced both the educational and technical objectives of the series. Existing materials used in the "Time Out" series made it possible to show people in real work situations at a variety of locations.

Identifying, selecting, and organizing the existing materials were the responsibilities of the Program staff. The reference specialist solicited and collected catalogs from a variety of film and videotape distributors, both commercial and public. These catalogs were reviewed for usable material; any potential resource was added to a master list and considered for screening based on its: (1) applicability to the content areas; (2) appropriateness of the stated grade level of the material to the primary audience; and (3) reasonable rental or preview cost.

At the outset, screening involved the entire Program staff. As demands on the directors and script writers increased, however, an evaluation team was formed to ensure consistent screening and evaluation procedures. The team consisted of two people: a content generalist and a representative of the production staff (usually the programming assistant who also served as script editor). Both members of the team reviewed the material for usable segment length, for biases in regard to sex and ethnicity, and for its overall quality. The production representative rated technical quality and investigated the per-minute cost and acquisition of broadcast rights. The content generalist evaluated the material for applicability to content objectives and appropriateness for age and language levels. The results of this joint evaluation were recorded on evaluation sheets and circulated to Program personnel.

During script design meetings, these evaluations determined which material would be included in a specific program. (Four programs consisted almost entirely of existing materials.) Sometimes both audio and video were used; occasionally, the audio was rewritten to update information or to combine a variety of film clips into a cohesive program segment.

When films were identified for inclusion in the series, broadcast rights were negotiated. Purchased films or videotapes were transferred to time-coded videotape. During the transfer of materials, the programming assistant and/or a content generalist wrote content summaries referenced to the time codes. This eased actual editing and produced a catalog of materials for future use. When a program was edited, the videotape editor located the time codes annotated by the script or suggested by the program assistant or content generalist. If a great number of short and precise tape edits were necessary, a content generalist worked with the tape editor.

FINAL PROGRAM EDITING

After completion of a production cycle, the editor, occasionally assisted by the executive producer and/or a unit director, completed the final editing of the programs. Program assembly integrated the standard open and close for the series, existing materials, and pre-determined segment transitions.

SUPPLEMENTARY MATERIALS

To supplement the junior high series, two print media products were designed, developed, and produced — the student magazine and the teacher's guide. The objectives of the student magazine were to: (1) promote student acceptance of the programming; (2) engage students in activities associated with the educational objectives of the Project; and (3) serve as reinforcement for classroom activity. The student magazine had a format similar to **TV Guide**. Distributed to each Closed Site student four times a semester, it contained program logs and included daily activities.

The objectives of the teacher's guide were to: (1) familiarize teachers with program content; (2) suggest ways in which community resources could be utilized in career exploration; (3) provide activities and discussion ideas for teachers who had varying backgrounds in career education and who had different teaching situations; and (4) serve as a source of ideas for classroom activities.

The introductory issue of the teacher's guide differed in format and content from subsequent regular updates. Its contents included an explanation of the Federation, a description of the STD and its program objectives, a map showing participating sites, an annotated bibliography of resources, and forms such as applications for jobs, colleges, and apprenticeship programs.

Monthly updates for the teacher's guide contained program logs, educational objectives, and discussion questions. A "Things To Do" section suggested written exercises, group activities, and projects emphasizing creativeness. Both the questions and the activities provided ways to localize the learning experiences by encouraging use of community resources. A copy of the **Index of Occupational Profiles** (Johnson, William Julius. Mesa, Arizona: Johnson Publishing Company; 1973) was provided to each Closed Site; some suggested activities were based on this resource.

Throughout the entire design and development procedure, user reaction was incorporated into the supplementary materials. Design ideas, first drafts, and revised drafts of the student magazine and the teacher's guide were distributed to the field for reaction in the spring, summer, and fall, 1973. The materials were also circulated among the STD staff for comments. An STD consultant, Dr. H. B. Gelatt, reviewed all materials relating to decision-making segments. Supplementary materials were also revised following the formative semester; second semester publications reflected modifications made in the "Time Out" programs.

The student magazine and teacher's guide were designed originally for the 56 "Closed Sites" which received the programming directly via satellite.

However, because the largest portion of the audience were students and teachers at "Open Sites" which received the programs via public broadcasting stations, arrangements were made for the printer of the materials to serve as distributor for interested Open Sites. The printer accepted orders (channeled through the Project's field network), packaged and shipped all materials, and billed the Open Site schools directly.

Conventional out-of-house offset printing was found to be the most effective method for producing the student magazine. This production method allowed the use of two colors, complex artwork, and photographs.

Once the formats for the materials were finalized, work on the actual products began. As a program script was approved for production, the print media specialist and content generalists developed the content of the student magazine and teacher's guide. Sites were asked to provide ideas and articles that might be of interest to students. The art department worked with the print media specialist to produce appropriate artwork and/or photographs. Copy was typed, assembled, and pasted up in preparation for the printers. Each issue of both publications took a month to print; packing and shipping took another three to four weeks.

LIVE SEGMENTS OF THE SERIES

Live television production associated with the "Time Out" series followed three formats: (1) pre-service; (2) "Time In"; and (3) "Time Out: Time For You." Coordinated by Field Service personnel, the pre-service broadcasts provided an introduction to each STD component. During each broadcast in the pre-service series, time was allotted for "live" audio interaction between the sites and the Denver staff.

"Time In" was a six-minute interactive mini-program scheduled at the conclusion of each day's J-Series broadcast and was designed to elicit comments and questions from participating students at Intensive Sites. Audience reaction led to its modification for the second semester to include a daily one-minute segment on various occupations found in the **Dictionary of Occupational Titles.**

"Time Out: Time For You" was a series of 12 Friday 30-minute interactive programs which reflected staff and user involvement and have been discussed in greater detail in the section, "Interaction."

ADULT EVENING AUDIENCES

BACKGROUND

Results of a series of formal and informal community surveys used to plan the adult evening programming had indicated that the informants did not perceive career development programming for adults as having high appeal over an extended period of time. A review of the program descriptions in early 1974, and consultation with the state coordinators, indicated that the series was in need of both a cohesive format and a compelling, provocative title.

FORMAT

"Footprints" was selected as the title for the adult evening series which provided assistance to communities in meeting some of the region's problems and concerns. The final schedule of program titles and topics included: (1) "Order No: 461111-LT7" (mail order consumerism); (2) "The Space Between Us" (interpersonal communication); (3) "The Great Land Race" (land use); (4) "For Purple Mountain Majesty" (cultural heritages); (5) "The Job Jungle" (career development for all); (6) "Super-Cooperatives" (farm cooperatives); (7) "Misterogers! Every Child's Neighbor" (early childhood education); (8) "Is There a Doctor in the County?" (rural medicine); (9) "Don't Hold Us Back" (senior citizens); (10) "Brass Tacks" (a summary of the STD with a look to the future).

Except for two programs ("Purple Mountain Majesty" which was completely pre-recorded and "Brass Tacks" which was a live panel discussion), the format for "Footprints" consisted of an opening title sequence, pre-recorded topic exposition, interaction, and closing sequence. Panel members and moderators were selected for their subject-matter knowledge and their ability to communicate. Sites were asked to contribute suggestions concerning the selection of these participants.

SCHEDULING

A decision to limit the length of evening programs to 50 minutes was necessary following a review of the transmission time available on the satellite. A 60-minute program desired by many community users was impossible since sufficient time was not available. The length of the evening series presented problems for public television stations in that it was difficult for them to schedule a 50-minute program produced once every three weeks. The Project suggested that the stations record all "Footprints" programs and broadcast them as a series when schedules permitted.

SERIES PRODUCTION

The series' projected budget ($11,410) and studio requirements of the J-Series precluded extensive in-house production for the "Footprints" programs. A search for existing footage associated with each topic was undertaken. Materials identified were screened for production quality, suitability of content, and applicability to the Rocky Mountain region. Most footage was obtained from organizations concerned with the topic. For the program, "Don't Hold Us Back," film was obtained from the National Council for Senior Citizens. For the program dealing with Rocky Mountain heritage and culture, each public television station in the broadcast area was contacted and asked to supply material; in response, several titles were submitted. Other material for this program ("Purple Mountain Majesty") was obtained from two Denver commercial stations. Only two segments of existing material were purchased — one from KMGH-TV Denver (for the cultural heritage program) and one from Appleshop Films of Kentucky (for the rural medicine program). Total cost for the purchased material in the series was $200.

Some out-of-house production was involved in three "Footprints" programs. Footage was shot in Rock Springs, Wyoming, for "The Great Land Race" and in Monte Vista and Antonito, Colorado, for "The Job Jungle." A half-hour program was edited from a two-hour session with Fred Rogers at the WQED-TV studios in Pittsburgh, Pennsylvania, for "Misterogers! Every Child's Neighbor." (Mr. Rogers also participated in "live" audio interaction from the Denver studio.)

Two programs utilized material taped at the STD facilities, "Order No: 461111-LT7," which included candid comments from consumers, and "The Space Between Us," which contained dramatic vignettes to illustrate some of the problems of interpersonal communication.

The pre-recorded segments of each program were structured to stimulate questions about content. At the conclusion of these segments, the moderator made a summary statement and introduced the panel members; each guest commented briefly on the issues raised by the program. Having alerted the sites for live audio interaction, the moderator selected one site from each state for each round of question/answer interaction with the panel members.

SUPPLEMENTARY MATERIALS

To provide sites with further program-related information, films associated with "Footprints" topics were sought for inclusion in the Materials Distribution Service. Because of budget constraints, all titles selected had to be acquired without cost. Many distributors of free films were contacted, resulting in the acquisition of 28 titles. After screening for content suitability, additional films were acquired with permission from the Great Plains National Instructional Television Library (GPN) and Encyclopaedia Britannica Educational Corporation (EBE).

A directory for evening program participants was prepared and distributed to each site. The directory consisted of: a catalog containing program title, description, and broadcast date and time; a Materials Distribution Service section providing film titles related to each program topic, complete with description and MDS catalog number; and a resource section with names, addresses, and telephone numbers of persons and agencies at the local, state, regional, and national levels who could provide information or suggestions concerning follow-up activities.

Promotional materials were designed and printed under the direction of the STD Public Information staff. Posters were distributed to all sites prior to each program; flyers were printed in English and Spanish for distribution through the schools; and press releases were issued to local newspapers.

SCHOOL STAFF IN-SERVICE AUDIENCE

Because the "Time Out" series was being broadcast primarily to one class in each of the participating schools, the STD thought it desirable to develop a teacher in-service series to inform interested educators in the school district about career education and to encourage them to utilize some of its principles in their daily classroom activities. This series of programs was developed as "Careers and the Classroom: A New Perspective for Teachers" and was presented bi-weekly from September 5, 1974, to May 1, 1975, as 16 career-related topics.

PROGRAM TOPICS

Program topics suggested by the sites were incorporated into the final schedule. These topics included: (1) "Career Education is for Everyone"; (2) "Continuing Education's Role"; (3) "The **Dictionary of Occupational Titles**"; (4) "Honest Self-Assessment"; (5) "Values and Strategies in Decision-Making"; (6) "Organizing and Facilitating Independent Learning"; (7) "Career Guidance Resources"; (8) "Career Education and the Standard Academic Curriculum"; (9) "Overcoming Biases in Counseling Students"; (10) "Ecology/Environment — How Do They Impact Upon Careers"; (11) "Unions and Career Education"; (12) "Job Security"; (13) "Tomorrow's Careers"; (14) "Earning a Living is Not Enough — The Art of Intelligent Spending"; (15) "Effects of Change on the World of Work"; and (16) "Career Education Today."

FORMAT AND PRODUCTION

The format for each program in the series was essentially the same. After an introduction by two STD staff specialists, the guests delivered a talk of 10 to 30 minutes in length and then answered questions from the sites for the remainder of the 55 minutes.

SUPPLEMENTARY PRINT MATERIALS

Each site participant in the in-service series received updates for each program. These updates contained biographies of the guests, outlines of the speeches to be given, and a space for the viewer to take notes. When additional materials were recommended by the guests, letters were written to the sites giving complete names and addresses for these resources.

COLLEGE CREDIT

The Field Services staff arranged for college credit and/or recertification for participants in the in-service programs. (See the section, "Field Services Network.")

MATERIALS DISTRIBUTION SERVICE (MDS)

BACKGROUND

The November 14, 1973, **Memorandum of Understanding** between the NIE and the STD required the establishment of a library of films and videotapes for transmission to participating sites. The titles selected were to vary across grade level and subject area. Sites were to be polled to select titles to be broadcast. In addition, plans were included to equip all participating Intensive Sites for the remote operation of their video cassette tape recorder from the Denver NCC.

SELECTION OF TITLES

NIE's suggestion that GPN be the source of all programs for MDS created a significant disadvantage for the STD's requirements regarding the service: The bulk of programming was grouped to run sequentially (e.g., viewing program number one was necessary for understanding program number two). Assuming an average of 20 sequential programs per series, using GPN would have limited the total MDS transmission to 15 series — an insufficient number to cover the range of subject areas and grade levels necessary for an effective, comprehensive service.

After visits and interviews with educational film producers across the country, the STD recommended the EBE as the primary source for MDS. EBE offered a diversified selection of individual programs which ranged across subject areas and grade levels. Further, the cost of EBE materials was competitive with GPN and within the MDS budget. Although concurring with the STD's recommendation, NIE required GPN representation in the final selections and consequently approved leasing 300 programs from EBE and 100 from GPN. This decision brought the MDS library to 400 titles (100 above the original number specified in the **Memorandum of Understanding**). Additional funds for the acquisition of the extra programs were supplied by NIE.

The initial selection programs for the MDS library was made from EBE and GPN catalogs by the potential users (teachers) at the sites. Teachers from all grade levels at the 56 sites were sent copies of both catalogs to review and were asked to select the programs they most desired. These selections were tabulated and ranking lists were developed which included more than 470 programs. Because the STD staff had limited time and resources to further refine the lists, professional education programming counselors from EBE and GPN reviewed the lists and recommended deletions. The programming counselors eliminated programs which were outdated, contained unsuitable content, or represented inferior technical quality. The remaining teacher-recommended programs, covering a broad range of subject areas and grade levels, became the MDS library.

BROADCAST PROCEDURES

Because EBE and GPN film prints could not be released to the STD for the entire year, the library of MDS programs was transferred to videotape to allow quick response to field requests. The contract price of GPN programs included the cost of transferring their programs to STD-supplied tape stock. High quality quadruplex videotape was selected as recording stock for the library, since lower cost small-format cassettes would have required additional electronic equipment at the sites to ensure adequate quality. STD personnel completed the transfer of all materials by August 1, 1974, five weeks before the first broadcast to the sites.

It was orginally planned that the ATS-3 voice channels would be used to order titles from the library and to set up broadcast dates; however, there was insufficient satellite time to meet increased user demand for ordering MDS material. Therefore, the plan was revised. A printed order form was sent to each site every six weeks, asking teachers to indicate their first, second, and third preferences. The forms were tabulated by Denver staff and used to develop the MDS broadcast schedule, which was mailed to each site. When the material had been scheduled for a six-week period, NCC personnel transmitted reminders of programs and times and advisories of any changes over the ATS-6.

During the first semester, additional satellite time, subject to preemption on 24-hour notice, was allocated by NASA for MDS programs. This extra time and the preemption situation led to an imbalance in the amount of programming received by the two "footprints" and created user complaints. Therefore, during the second semester, when extra time became available on short notice for MDS programming, the satellite system was used to notify the sites.

SUPPLEMENTARY PRINT MATERIALS

An MDS catalog and a program guide were provided for the users. The catalog listed alphabetically the 400 available titles. Each program was also listed by subject area and included title, length of the program, recommended grade level, and a content summary. Four copies of the catalog were sent to each site and were used by teachers to order programs.

The program guide, a bound volume which included GPN and EBE information about the titles, was provided for teachers as a guide to MDS. The guide suggested educational applications for each film or videotape. Three complete volumes of the program guides were sent to each site.

OTHER PROGRAMS

The STD program staff developed and produced a number of other programs for specialized audiences. Eighteen special satellite "feeds" were transmitted between July 9, 1974, and May 16, 1975. Each described STD objectives and demonstrated the satellite system's interactive capabilities.

A July 31, 1974, presentation gave general information about the STD and showed a portion of the "Villa Alegre" series developed by Bilingual Children's Television (BCTV). In attendance at this presentation, which was transmitted from Denver to Washington, D. C., were 52 individuals representing Congress, NIE, the Office of Education, NASA/Goddard Space Flight Center, the U.S. Information Agency, Fairchild Industries, and several unaffiliated but interested individuals. This broadcast was one of several made to individuals representing the private sector, the legislative and executive branches of the federal government, and various regulatory agencies.

Special presentations were also made to the Space Applications Board of the National Academy of Engineers, the Institute of Electronic and Electrical Engineers, the Russian Minister of Health, the Space and Missile Systems Organization, the Society of Motion Picture and Television Engineers, the National Association of Educational Broadcasters, the American Association for the Advancement of Science, the Mountain States Regional Medical Conference, and an annual Federation meeting.

Residents of Juneau, Alaska, were able to receive three special news programs, through the Project's broadcast network, including President Nixon's resignation speech and President Ford's acceptance address. The programs were fed from Washington, D. C., to Denver over Public Broadcasting Service land lines, with the ATS-6 providing the link from Denver to Juneau.

Dr. Gerald Soffen, project scientist for NASA's Viking Project, made two presentations describing the Viking Mars mission. Students at

Intensive Sites were able to question Dr. Soffen and receive his immediate answers "live" via the ATS-3.

A presentation for the American Association for the Advancement of Science was made at the request of the Lincoln Center for the Performing Arts in New York. This live broadcast of a ballet performance and its critique were made for an audience of UNESCO representatives and others interested in the application of science and technology to the arts.

A special feed to the Mountain States Regional Medical Conference in Bozeman, Montana, demonstrated the utility of satellite broadcasts to the medical field, both in providing critical assistance in life-and-death situations and as a teaching tool for medical personnel in remote areas.

"We Are Here" and "Today's Commitment" were STD public information programs shown not only to special interest groups via satellite but also to participating sites. Other interested groups viewed these programs by videotape.

During the year, the STD provided personnel and facilities for other educational endeavors, including programs about the annual Denver Career Fair (funded by Mountain Bell Telephone Company) and the Emergency Medical Technicians Refresher Course (funded by the Robert Wood Johnson Foundation, the Mountain States Health Corporation, and the participating states).

INTERACTION

PURPOSE

Interaction, the capability of STD participants to communicate with one another and with STD staff in Denver via the ATS-3, was used to achieve a variety of objectives: (1) increased acceptance of the programming; and (2) increased gains in knowledge. To investigate the capacity of interaction to realize these objectives, a variety of formats were designed and implemented.

INTERACTION USING THE SATELLITE

Audio interaction was used in every series developed by the STD. The format for interaction was question-and-answer or comment-and-response.

The junior high series consisted of 81 one-half hour programs; 69 were pre-recorded and 12 were live to utilize the interaction capability between Intensive Sites and Denver via the ATS-3 satellite. In addition to the 12 live programs per semester, each day's broadcast schedule included the transmission of the pre-recorded program followed by 6 minutes of live programming. These 6-minute segments, entitled "Time In," enabled students to ask questions and to make comments about the program.

AUDIO INTERACTION

During the first semester, "Time In" was moderated by two staff members (on camera) assisted by content personnel (off camera) who constituted a "knowledge pool" for content-specific questions. Most of the questions asked were requests for information about salaries and training requirements; and aptitudes, interests, and temperaments associated with various careers. During the second semester, the moderator for "Time In" was a content generalist and a segment entitled "Occupations of the Day" was added. This segment, a visual presentation of 10 occupations (with **DOT** reference numbers) was designed to reinforce student exposure to a large number and variety of career alternatives.

The 12 Friday 30-minute interactive programs called "Time Out: Time For You" were also different during each semester. During the first semester, the Project experimented with a variety of formats, including (1) mini-dramas (in-studio teenagers role-played "conflict" situations to which students at the sites reacted); (2) debates (two Intensive Sites presented opposing positions for comment by other Intensive Sites); (3) "knowledge pool" programs (extensions of the "Time In" program which encouraged student questions); and (4) a series of special panels (featuring broadcast and engineering personnel, a tour of the studio, and a group of actors including the puppeteer) to give students at Intensive Sites the opportunity to communicate with the "experts."

Second semester "Time Out: Time For You" programs retained the special panel show format but added two types of live programs. The first type was a series of shows presenting experts who represented various post-secondary career alternatives and answered students' questions: people from colleges, universities, junior and community colleges, private and public vocational-technical schools, and union apprenticeship programs. The second new type of live programming during second semester was site produced. Interested sites developed program segments about their own communities and sent film, slides, scripts, and audio tapes to Denver where production staff edited them onto videotape for broadcasting. After each site presentation, other Intensive Sites asked questions about the program.

DIGITAL INTERACTION CAPACITY

Interaction which would utilize digital pads at participating sites was part of the original STD proposal. The first junior high series scripts specified digital use during "Time Control Central" segments and during segments designed in a variety of quiz show formats. Lack of funding precluded actual implementation of these plans. However, limited testing of the feasibility of transmitting data via a digital system was conducted during the spring, 1975.

Federal budget cutbacks prevented the establishment of the originally planned land-line telephone system connecting Receive-Only Sites with the Denver facility during "Time In" and "Time Out: Time For You."

INTERACTION WITHOUT THE SATELLITE

In the live segments of STD programming which emphasized interaction and involved Intensive Sites directly, every attempt was made to encourage participation of the Receive-Only Sites. Topics were announced as far in advance as possible and questions by mail were solicited. Letters received from students were either answered by mail or read during live broadcasts.

EVALUATION PLAN

BACKGROUND

Prior to June, 1973, while the STD was under the auspices of the Office of Education, research personnel resided within different organizational components. Their respective activities and tasks were determined by the goals and objectives of the components, rather than by those of the overall Project. This organizational arrangement often resulted in duplication of effort and conflicts of interest.

In June, 1973, when STD was transferred from the Office of Education to the National Institute of Education, a major Project reorganization occurred. The research staff was centralized and became a separate component. At that time, the process of developing an STD Evaluation Plan began. In this effort, the staff was assisted by a research advisory board of national stature and by prominent consultants who worked on specific studies. The experience of these individuals was invaluable in addressing the three major problems which occurred during the process of designing the STD Evaluation: (1) goal congruence; (2) decisions made prior to the June, 1973, reorganization; and (3) resource constraints.

EARLY PLANNING

An August, 1973, Evaluation Plan specified efforts dealing with hardware and hardware-support elements, attraction of audiences, holding or retention of audiences, costs associated with STD products and services, and developmental processes.

In addition, the Plan identified major variables selected on the basis of: (1) their perceived relevance to Project goals and objectives; (2) the STD's ability to exert some systematic control over their variation; and (3) the amount of resources necessary to obtain quantifiable measures of their status. The plan also took into consideration the various populations under investigation: those who viewed television broadcasts of the Demonstration (and personnel of the STD and other agencies or institutions at the state or local level which were associated with or aware of the STD endeavor).

The primary purposes of the Evaluation Plan were: (1) to determine whether the STD met its goals and objectives; (2) to accomplish the "test-and-evaluate" task described in the Project objectives; and (3) to assist in the formative development of video products and related services.

MAJOR AREAS OF STUDY

For these purposes, six major areas of study evolved, each with its own specific objectives. The differences among these six areas were largely conceptual rather than practical, and all data collection activities were organized to eliminate duplication of effort within any one population. The studies and their objectives were:

1. **Hardware and Hardware Support:** To describe and analyze the effectiveness of the hardware and hardware support elements of the Satellite Technology Demonstration.
2. **Audience Acceptance Studies:** To describe and analyze the acceptance of the STD and its products and services by selected audiences.
3. **Student Learning Gains Study:** To describe and analyze the career-related knowledge and attitude acquisition of participating junior high school students.
4. **Significant Events:** To document the significant events associated with the planning, development, operation, and evaluation of the Demonstration.
5. **Case Study:** To implement comprehensive case studies designed to provide an in-depth exploration of the effects of the Demonstration at three participating sites.
6. **Cost Study:** To document and analyze the costs incurred in the provision of selected STD products and services.

EARLY DECISIONS

Implementation of the Plan began with a series of efforts leading to the refinement of student programming. As previously discussed, these plans were negatively affected by federal decisions which resulted in studio construction delays. The next step in the Plan called for the collection of both demographic data and audience opinions relative to those STD products and services provided during the operational year. In addition to this routine audience acceptance data, the student population was given comprehensive pre- and post-test batteries to identify changes in career-related knowledge and attitudes which occurred during STD participation. Another source of data was the daily signal quality readings that site personnel made concerning their television reception.

The original Plan specified two methods of data collection: (1) the 24 Intensive Sites would transmit data daily via a digital system; and (2) the 32 Receive-Only Sites would mail in data on a weekly basis. Due to federal decisions, the two-way digital capability was eliminated from final plans and all data were handled by mail. All data collection activities were conducted through the field services network.

Decisions made prior to the June, 1973, reorganization greatly influenced the type of evaluation which could be conducted and clearly dictated a quasi-experimental approach rather than the application of true experimental designs. The absence of random selection precluded the making of any generalizations beyond the participating populations.

RESOURCE CONSTRAINTS

In planning the Evaluation, it was necessary to determine those resource constraints affecting the development and implementation of the overall Plan, including: (1) the size of the research staff; (2) budget allocations; (3) the magnitude of the overall effort; (4) available computer facilities for data analyses; and (5) time constraints on the processing, analyzing, and reporting of data.

Considering the STD goals and objectives and the importance of the effort for future decision-makers, the decision was made to collect the widest array of data possible. This planning decision was made with the full realization that, under existing resource constraints, the major part of all data analyses would occur at the descriptive level. However, the provision of a broad data base covering all aspects of the STD was considered to be of more value to both present and future decision-makers than any in-depth examination of only a few aspects. Also, possibilities existed for later in-depth analyses of the data collected.

Resource constraints greatly influenced the specification of independent variables. The list of STD-related variables was generally complete, but those lists of characteristics relative to individuals, schools, and communities did not include all possible variables. Selections were made on the basis of perceived relevance. (All variables have been defined within the section, "Overview of Evaluation Studies.")

MAJOR POPULATIONS FOR STUDY

The major populations included in the overall Evaluation were determined primarily by decisions made prior to the development of the Plan. The STD goals, developed in conjunction with NIE, specified that the populations were to reside in isolated, rural communities. (A description of the sites and their selection has been given in the section, "Field Services Network.") The identification of specific populations within each community was guided by previous decisions regarding: (1) programs to be broadcast; (2) broadcast schedules; and (3) the involvement of public television stations. On the basis of these factors, the following major populations were identified:

STD Site Operators. Individuals in the sites who were primarily responsible for operating the STD hardware/equipment (referred to in other sections as "site coordinator").

Career Development Teachers. Teachers in the sites who were responsible for the students involved in the STD classes.

Students. Junior high school students participating in STD classrooms throughout the eight-state region.

School Staff. Persons employed within the participating schools and school systems. Different levels of assessment occurred for various groups of school staff, depending upon their type and degree of involvement in STD activities.

Community and State Leaders. Selected community- and state-level opinion leaders, including school board members, key community- and state-level business, industry, political, and professional persons.

General Audience. Those community members viewing the STD's adult evening programs.

Public Television Audience. Viewers in three selected communities who could have received the STD programs redistributed by local public television stations.

Denver Staff of STD. Persons working in the Denver regional office who also provided data relevant to the overall Evaluation, especially within the "Significant Events Study."

These populations have been categorized in Table 9.

TABLE 9
Major STD Populations

School	Community	STD
1. CAREER DEVELOPMENT TEACHERS	1. COMMUNITY AND STATE LEADERS	1. SITE OPERATORS
2. JUNIOR HIGH SCHOOL STUDENTS	2. GENERAL AUDIENCE MEMBERS	2. STATE COORDINATORS
3. SCHOOL STAFF	3. PUBLIC TELEVISION AUDIENCE MEMBERS	3. DENVER STAFF OF THE STD

OVERVIEW OF EVALUATION STUDIES

The six summative studies comprising the Evaluation Plan have been described in terms of purpose, major questions, dependent and independent variables, and instrumentation, and those STD products and services functioning as independent variables in a majority of the studies have been defined.

STD PRODUCTS AND SERVICES

STD evaluation-related products and services have been categorized as: (1) program variables; (2) hardware-related variables; and (3) support materials and services variables.

PROGRAM VARIABLES

The following three television series were produced and broadcast by the STD:

1. **"Footprints."** These 10 topical evening programs for adults were 50 minutes in length and incorporated audio interaction via the ATS-3 satellite. Broadcast of the programs occurred once every three weeks.
2. **"Careers and the Classroom: A New Perspective for Teachers."** The in-service programs for school staff comprised this series. Broadcast once every two weeks, the program was 55 minutes in length and incorporated live audio interaction via the ATS-3.
3. Student Programs.
   (a) **"Time Out."** This 16-week series dealt with career education concepts and consisted of materials produced by the STD as well as existing materials. Usually broadcast Monday through Thursday, the program was 28 minutes, 50 seconds in length.
   (b) **"Time For You."** Broadcast on 12 Fridays, this program involved 28 minutes, 50 seconds of live audio interaction. During the second (summative) semester, three different program formats were utilized: (1) programs on post-secondary options, with visiting experts from all levels of education beyond high school; (2) programs concerning various aspects of the STD, with members of the STD staff as guests; and (3) programs developed and produced by the sites, with the aid of the STD production staff.
   (c) **"Time In."** Monday through Friday, six minutes of live interaction via satellite immediately followed "Time Out" and "Time For You." This program provided students an opportunity to ask questions (usually within the area of career education) of STD specialists. On Friday, this program occasionally consisted of oral responses to letters received from students at Receive-Only Sites.

HARDWARE-RELATED VARIABLES

The hardware-related variables were: (1) type of site; and (2) audio interaction.

1. Type of Site. Different sites were defined on the basis of their reception of STD products and services. These were:
   (a) **Intensive Terminal (IT) Sites.** Twenty-four selected junior high schools received video programs directly via satellite. In addition, they had the audio capability of interacting with staff at the Denver NCC and with each other through ATS-3.

Each of these sites received support materials and participated in a Materials Distribution Service.

(b) **Receive-Only Terminal (ROT) Sites.** Thirty-two selected junior high schools received video programs directly via satellite, received printed support materials, and participated in a Materials Distribution Service. However, they were unable to interact via satellite.

(c) **Open Sites.** Thirteen junior high schools elected to receive the student programming via local public television stations and received support materials from the Project.

(d) **Comparison Sites.** Six junior high schools which did not receive any STD products and services elected to participate by having students complete the same pre-tests and post-tests as those given students at other STD sites.

2. Audio Interaction.

SUPPORT MATERIALS AND SERVICES VARIABLES

The following support materials and services were provided by the STD:

1. **Materials Distribution.** Films and videotapes were distributed via satellite for the sites to use in real time or to record for use later.
2. **Student Magazine.** A magazine (consisting of daily program information , articles, comic strips, and content-related games and puzzles) was given to each student. The format was designed to increase student acceptance and the content was intended to reinforce each day's career education programming.
3. **Teacher's Guide.** A guide (consisting of daily program objectives, discussion questions, learning activities, and key vocabulary words as well as general background information) was given to each teacher.
4. **Public Information Materials.** These materials were distributed to inform the general public about the Project's products and services.
5. **Field Network.** A human support system was established for communication, site activity monitoring, and data collection. It included site, state, and Denver-based personnel.

The STD products and services have been categorized in Table 10.

TABLE 10
STD Products and Services

PROGRAMS	HARDWARE-RELATED	SUPPORT MATERIALS/SERVICES
1. Adult Program: "Footprints"	1. Audio Interaction	1. Materials Distribution
2. School-Staff Program: "Careers and the Classroom"	2. Type of Site: a. Intensive b. Receive Only c. Open d. Comparison	2. Materials: a. Student Magazine b. Teacher's Guide c. Public Information
3. Student Programs: "Time Out" "Time In" "Time Out: Time For You"		3. Field Network: a. Site Personnel b. State Personnel c. Denver-based personnel

HARDWARE AND HARDWARE SUPPORT STUDY

The purpose of the "Hardware and Hardware Support Study" was to assess the performance effectiveness of the satellite communications system and associated human support in the delivery of audio and video signals to receiving sites. It addressed the following questions:

1. What was the level of signal quality at each receiving site ?
2. What was the level of reliability of the hardware elements of the delivery system ?
3. What was the level of site operator performance ?

Following is a discussion of the instrumentation used and an explanation of the independent and dependent variables:

WHAT WAS THE LEVEL OF SIGNAL QUALITY AT EACH RECEIVING SITE?

DEPENDENT VARIABLE

The dependent variable, signal quality, was defined as the ratio of the power of the received signal to that of the noise level (unwanted interference), referred to as the "signal-to-noise" ratio.

INDEPENDENT VARIABLES

The following three independent variables were associated with signal quality:

1. Climate conditions: temperature, wind, rain, snow, ice, and cloud cover.
2. Operational status of the ATS-6 and the ATS-3: radio frequency, output, attitude stability and pointing accuracy, orbital stability and inclination, and effective radiated power.
3. Geographical location (of receiving sites).

INSTRUMENTATION

Signal quality was assessed objectively by obtaining the appropriate signal level measurements on a voltmeter and computing the signal-to-noise ratio. In addition, signal quality was assessed subjectively, using a numerical system similar to the Television Allocation Study Organization (TASO) ratings. These corresponded to picture-quality grades which site and NCC personnel used for video signal assessments. Data relative to signal quality were recorded by site personnel on special Optical Mark Read (OMR) cards designed by the STD staff. Climate conditions were recorded by site and NCC personnel, using standardized and coded descriptive scales. Data on the operational status of the ATS-6 and ATS-3 were obtained from NASA. The geographical locations of receiving sites sites were determined by site selection.

WHAT WAS THE LEVEL OF RELIABILITY OF THE VARIOUS HARDWARE ELEMENTS OF THE DELIVERY SYSTEM?

DEPENDENT VARIABLE

The dependent variable, hardware reliability, was defined as the ability of hardware components to perform over a period of time the function for which they were designed.

INDEPENDENT VARIABLES

Climate conditions were independent variables affecting hardware reliability and signal quality.

INSTRUMENTATION

Data for assessing hardware reliability was collected by logging the performance of hardware elements. Mean time to failure and mean time to repair were then computed. Assessment of climate conditions has been described previously.

WHAT WAS THE LEVEL OF SITE OPERATOR PERFORMANCE ?

DEPENDENT VARIABLE

The dependent variable, site operator performance, was defined as the ease and efficiency with which individuals operated the equipment used in the STD network.

INDEPENDENT VARIABLES

The two independent variables used to examine site operator performance were capability and past technical experience of the user.

INSTRUMENTATION

1. Ease of Operability. Opinion questionnaires regarding the equipment's ease of operability were administered periodically.
2. Operator Ability. Data relative to the site operators' capabilities were gathered through the administration of a written test immediately after training.
3. Past Technical Experience. This variable was assessed by an information poll.

AUDIENCE ACCEPTANCE STUDIES

The purpose of the "Audience Acceptance Studies" was to collect, describe, and analyze data relative to the acceptance of the STD's products and services by selected populations. One study was conducted for each of the following populations and audiences: (1) students; (2) school staff;

(3) school staff attending in-service training; (4) general audience; (5) the public television audience in three selected communities; and (6) community and state leaders.

"Acceptance," the major dependent variable for all "Audience Acceptance Studies," was defined as: "Those self-reported overt acts and / or expressed opinions indicating agreement or approval by individuals or groups of the STD and its products and services." Following is a description of each study in terms of its evaluation questions and independent variables.

The "Student Acceptance Study" addressed the following questions:

1. What were the expressed opinions of students regarding the STD class and the STD products and services ?
2. Were there any differences in expressed opinions between or among students with different characteristics or at different types of sites?
3. What was the relationship between student acceptance and teacher acceptance ?

Independent Variables

The independent variables for this study occurred within the following three categories:

1. Selected STD Products and Services:
   - (a) type of site (Intensive, Receive-Only, Open);
   - (b) audio interaction;
   - (c) the three student programs ("Time Out," "Time In," "Time For You"); and
   - (d) the student magazine.
2. Student Characteristics:
   - (e) age;
   - (f) sex;
   - (g) grade (the school-designated educational level);
   - (h) ethnicity (ethnic-cultural background);
   - (i) achievement (the educational level attained by students regardless of age or grade, as described by standardized grade-level achievement scores); and
   - (j) locus of control (the orientation of the needs or desires which drive a student to learn or achieve, as measured by the **Bialer-Cromwell Locus of Control Scale**).
3. Other Variables:
   - (k) teacher acceptance (the self-reported overt acts and expressed opinions of teachers which indicated their

agreement or approval of the student programs and the STD class).

SCHOOL STAFF ACCEPTANCE STUDY

The "School Staff Acceptance Study" was conducted at three points in time, i.e., before broadcast, between semesters, and at the end of broadcast. The following questions were addressed:

1. Between each of the three measurement points, what were the changes in school personnel acceptance levels ?
2. What relationships existed among school staff perceptions of the school climate, staff characteristics, and STD acceptance ?
3. What discriminations were made between the STD products and services by school staff respondents ?

Independent Variables

The independent variables for this study consisted of the following:

1. STD Products and Services. All of the STD products and services previously defined functioned as independent variables for this study.
2. School Staff Characteristics. The following school staff characteristics were determined:
   (a) age;
   (b) sex;
   (c) school position;
   (d) level of education;
   (e) professional experience;
   (f) length of residence in the community; and
   (g) length of residence in the state.
3. STD-related Variables:
   (h) time allotted to STD activities;
   (i) attendance at STD broadcasts; and
   (j) pre-broadcast orientation to the STD.

GENERAL AUDIENCE ACCEPTANCE STUDY

The "General Audience Acceptance Study" considered the following questions:

1. To what degree did the STD attract general audience members ?
2. To what degree did the STD hold general audience members across program topics ?
3. What were the expressed opinions of general audience members regarding the STD and selected products and services ?

Independent Variables

The independent variables for this study occurred within the following three categories:

1. Selected STD Products and Services:
    - (a) type of site (Intensive, Receive-Only);
    - (b) audio interaction;
    - (c) the evening "Footprints" series for adults;
    - (d) public information;
    - (e) the field network (in the form of the site coordinator); and
    - (f) the 10 different program topics presented in the evening series.
2. Audience Characteristics:
    - (g) viewing habits (as described by hours watching television);
    - (h) sex;
    - (i) ethnicity (ethnic-cultural background);
    - (j) educational background (as described by years of educational endeavor); and
    - (k) distance from site (as described by the number of miles an audience member traveled to attend the STD programs).
3. Other Variables:
    - (l) the number of programs watched within the "Footprints" series;
    - (m) communication vehicle through which viewer learned of the program, e.g., posters, radio spot, word-of-mouth; and
    - (n) ratings of programs on dimensions of pleasurability and helpfulness.

PUBLIC TELEVISION ACCEPTANCE STUDY

The purpose of the "Public Television (PTV) Acceptance Study" was to assess the acceptance of the STD programs re-broadcast by public television stations. Due to resource constraints, the "PTV Acceptance Study" was conducted in only three communities selected by random sampling techniques. The following questions were asked:

1. To what degree did the STD attract PTV viewers?
2. To what degree did the STD hold the viewers across program topics?
3. What were the expressed opinions of PTV viewers regarding the STD programs?

Independent Variables

The independent variables for the PTV study occurred within the following categories:

1. Selected STD Products and Services:
   - (a) the evening series for adults ("Footprints");
   - (b) the student program series, "Time Out";
   - (c) public information materials; and
   - (d) the 10 program topics utilized in the "Footprints" series.
2. Audience Characteristics:
   - (e) age;
   - (f) sex; and
   - (g) ethnicity.
3. Other Variables:
   - (h) the number of programs viewed within the "Footprints" series and the "Time Out" series.

COMMUNITY AND STATE LEADERS ACCEPTANCE STUDY

The "Community and State Leaders Acceptance Study" asked the following questions:

1. To what degree did community and state leaders know about the STD and its products and services ?
2. To what degree did community and state leaders actually participate in STD activities ?
3. To what degree did community and state leaders support local policies regarding the STD ?
4. What recommendations were made for continued participation in the STD ?

Independent Variables

Two major independent variables were deemed relevant for the Community Study:

1. STD Products and Services: All STD products and services, as previously defined, functioned as independent variables for this study.
2. The Characteristics of Community and State Leaders:
   - (a) age;
   - (b) sex;
   - (c) length of residence in state and community;
   - (d) occupation; and
   - (e) attendance at STD broadcasts.

AUDIENCE ACCEPTANCE INSTRUMENTATION

The assessment of audience acceptance could have involved many efforts: (1) observations of audience viewing behavior; (2) on-site observations of resulting outcomes; and (3) standardized attitude scales. However, resource constraints (including the small staff and the magnitude of the overall acceptance effort) prohibited the use of these techniques at all sites.

STUDENT LEARNING GAINS STUDY

The primary purpose of the "Students Learning Gains Study" was to describe, analyze, and interpret data relative to final student performance on the career education concepts incorporated in the student programming.

The overall student effort was conducted on a two-semester basis. The first semester was a formative effort, providing information for program revision. In addition, data for completing a criterion-referenced test were collected and other summative instruments were tested. The second semester was a summative effort, providing data required for making judgments about program effectiveness.

Though the two semesters had major differences in purpose, summative data were collected on a pre- and post-basis for both semesters. The summative data resulting from the first semester effort have been reported at a descriptive level in the section, "Results and Conclusions." In addition, an effort was made during the summative semester to provide data for addressing the following question:

1. What was the average gain or change in students' career-related knowledge and attitudes ?

In addition, the following questions were also tested:

2. Are there differences in career-related knowledge or attitudes between or among students:

   H_1: at different types of sites;
   H_2: of different ages;
   H_3: of different sexes;
   H_4: at different grade levels;
   H_5: of different ethnic backgrounds;
   H_6: with different achievement levels;
   H_7: with different Loci of Control;
   H_8: with teachers demonstrating different levels of acceptance;
   H_9: with different levels of acceptance?

DEPENDENT VARIABLES

Two types of dependent variables were utilized for the student effort:

1. Career-Related Knowledge. The steps in the information required for and the effects of career decision-making.
2. Career-Related Attitudes. Feelings toward the world of work and making a career choice.

INDEPENDENT VARIABLES

The independent variables for the PTV Study occurred within the following categories:

1. Selected STD Products and Services:
   (a) type of site (Intensive, Receive-Only, Open, Comparison).
2. Student Characteristics. The following student characteristics were selected as independent variables:
   (b) age;
   (c) sex;
   (d) grade (the school-designated educational level);
   (e) ethnicity (the ethnic-cultural background of students);
   (f) achievement (the educational level attained by students, regardless of age or grade, as described by standardized grade-level achievement scores); and
   (g) Locus of Control (the orientation of the needs or desires which motivate a student to learn or achieve, as measured by the **Bialer-Cromwell Locus of Control Scale**).
3. Other Variables:
   (h) teacher acceptance (overt behavior and expressed opinions of teachers relative to the student programs and the STD class); and
   (i) student acceptance.

STUDENT LEARNING GAINS INSTRUMENTATION

Three types of instrumentation were used to assess student characteristics and the STD's effect on the students' career-related knowledge and attitudes: (1) the **Attitude Scale** and the **Competence Test** of the **Career Maturity Inventory**, a standardized test battery published by CTB/McGraw-Hill, Inc., and developed by John Crites; (2) the **"Time Out" Test**, a criterion-referenced instrument developed by the STD staff; and (3) the student membership card, designed by the staff.

The **Career Maturity Inventory**

The STD staff selected the **Career Maturity Inventory** (CMI) on the basis of the following criteria:

1. Established validity and reliability as revealed by a review of the research and instrument development literature.

2. Positive judgments by STD content specialists and other consultants relative to the appropriateness of each instrument for assessing programming outcomes.
3. The appropriateness of each instrument in terms of vocabulary and readability, as revealed by a pilot study involving local students.

Following is a brief description of each major section of the **CMI**:

1. The **Competence Test,** three sections of which were relevant for measuring the desired outcomes of student programming:
   Part I: Knowing about jobs (job awareness)
   Part II: Choosing a job (self-assessment)
   Part III: What should they do? (decision-making)
2. The **Attitude Scale,** which measures feelings about choosing a career and entering the work force.

The **"Time Out" Test**.

The **"Time Out" Test** was a criterion-referenced instrument comprised of items designed to measure the behaviors described in the J-Series learning objectives. This test was developed through the following procedures:

1. The Research staff and content generalists wrote at least three test items for each content objective, using information memos prepared by the content generalists. A total of 177 true/false and multiple-choice items resulted.
2. Both the content generalists and consultants in tests and measurement rated all items individually in terms of: (a) degree of relevance for a particular objective; (b) degree of relevance for a career education domain; (c) clarity; and (d) appropriateness for junior high students.
3. Following the rating effort, those items receiving an average rating of 3.5 or lower on any one 5-point scale were rewritten. The suggestions and ideas of STD staff and consultants guided the rewrite effort.
4. During the formative semester, the staff employed a matrix sampling model and presented each first semester student with 27 items on a pre-test and 27 items on a post-test.
5. At the conclusion of the first semester, average gain scores were calculated for each item. Thirty-eight true/false and twenty-six multiple-choice items were found to have significant pre-post gains and were selected to comprise the **"Time Out" Test** given to all second semester students on a pre- and post-test basis. An odd-even reliability coefficient, corrected by the Spearman-Brown formula, was calculated for those scores generated by each administration of the test.

The above procedures ensured the criterion-related validity of the **"Time Out" Test**.

Student Membership Cards

To assign identification numbers and collect student demographic data, the STD staff gave each student a special membership card. This card consisted of two different sections: One, to be retained by the student, provided blanks for the student to write his or her ID number and name. The other, on which the ID number was pre-printed, contained questions concerning demographic characteristics. After the pre-testing and completion of the cards, the demographic sections were returned to the STD. Thereafter, all students placed their ID numbers on every instrument they completed. This enabled the data to be analyzed without using students' names.

SIGNIFICANT EVENTS STUDY

GENERAL PURPOSE

The "Significant Events Study" had as its purpose the documentation and analysis of those events affecting the Demonstration. One aim of this study was to provide a record which would allow decision-makers to capitalize on the experiences of the Project.

Pivotal to the study was the determination of what occurrences would be considered "significant." In this regard, significant events were operationally defined as "those incidents occurring either within the Project or in the environment which have a major impact on the nature of the goals, structure, procedures, inputs, and outputs of the Demonstration.

RESEARCH DESIGN

The definition of a significant event was consonant with the holistic perspective assumed by the study; it facilitated the use of a general systems model — which directs attention to particular classes of elements such as goals and processes — in the analysis of the significant events. This general framework called for a research design which was exploratory rather than experimental in nature; for a mode of inquiry in which conclusions evolved inductively from observations, rather than deductively from established doctrine or theory. No attempt was made to intervene, to manipulate, or to control situations. Predicated on the study's exploratory nature, the research plan was "developmental-descriptive," and the gathering of historical information thus proceeded in a pragmatic manner.

METHODOLOGY INSTRUMENTATION DOCUMENTATION

Initially, a data-gathering methodology was employed which depended primarliy on participant observation, i.e., the historian's view of behavior patterns or expectations as derived from conversations and work routines. The second source of information was documentary materials (position papers, memoranda, letters, reports) which were systematically analyzed to identify significant events and to track the development of issues over time. Finally, semi-structured interviews were conducted on a non-routine basis with selected informants to elicit their views on specific issues; questionnaires were not used; all information was confidential and under the sole control of the researcher.

In January, 1975, reasons external to the Demonstration necessitated the out-of-state relocation of the individual having primary responsibility for the "Significant Events Study." Consequent reallocation of staff resources to assure completion of the study led to a review which revealed that the historical aspects of the study were being hindered by certain attributes of the methodology:

1. Confidentiality:
    - (a) prevented staff feedback as to the completeness of the historical base being established; and
    - (b) made the data difficult to cross validate.
2. Documentary materials:
    - (a) All early documentation had been accomplished through an external formative evaluation effort contracted by the Stanford University Department of Communication. This document, **History and Recommendations Resulting from Evaluation Planning for the Federation of Rocky Mountain States' Educational Technology Demonstration**, was not made available to the STD until December, 1974, although it had been submitted to the Office of the Secretary, DHEW, in May, 1974.
    - (b) Because of limited access to past historical efforts, the researcher had to conduct an extensive review of early documentation.
    - (c) The researcher had no consistent source for these materials and had to gather them through time-consuming and widespread searches.
    - (d) The reliance on documents as a source of information adversely affected attempts to maintain an ongoing history of current activities.

For these reasons, the second phase of the study was characterized by a shift in methodology. The staff responsible for the effort decided to gather historical data on an ongoing basis. This shift resulted in a strong emphasis on personal contacts, established through highly structured, bi-monthly interviews to document current activities. (Further documentary search for records of past events was delayed until the completion of the interviews.) Prior to each series of interviews, the informants — primarily Project management and component directors — were provided with an instrument which posed questions in five areas:

1. External Contacts: What external contacts have you had during this period of time? Which of these has produced or may produce a significant result?
2. Decisions: What decisions were made during this time which had or will have consequential impact?
3. Achievements: What important tasks or goals have been completed or resolved in this period?

4. Problems: What problems of magnitude appear to be continuing, unresolved, at this time? During this period of time, have new problems which may be significant surfaced? What are they?
5. Documentation: What documents, relevant to the substance of this interview, can you provide for the historical record?

Other Project personnel were consulted informally to document events about which they had some specialized knowledge.

Information gained from these personal contacts was used as the data base for a monthly report, "Summary of Interview Data," which was a distillate of significant events and issues of the preceding month, presented in as factual a context as possible. This summary was circulated among the key staff for their additions, deletions, suggestions, and general reaction. All data was stored, with relevant documents supplied by the informants, in a simple, bi-month chronological file.

The methodology of providing staff an opportunity to respond to and critique information was integral to building a factual historical base.

CASE STUDY

Because of the complexity of the STD, it was considered essential that subjective insights be obtained concerning the positive and negative effects of the Project on participating schools and communities. Three sites were selected for observation of the "dissemination-adoption" process. Specifically, there were two major purposes for the "Case Study": (1) to provide insights to help in structuring, amplifying, clarifying, and interpreting other statistical data; and (2) to yield a better understanding of the processes, interactions, problems, and successes associated with site participation.

The sequential observations at the selected sites were guided by the following questions:

1. How were sites selected and what were the consequences of the selection process?
2. What were the activities associated with site preparation and were they adequate?
3. What were the acceptance patterns among audience members to various STD products and services?
4. What were the positive and negative effects of STD participation in terms of curricula, resource allocations, school procedures, and school and community relations?
5. How has participation affected the site's willingness to be involved in future efforts?

MAJOR VARIABLES FOR THE CASE STUDY

The major variables identified for case study observation consisted of: (1) observed levels of site involvement in STD-related activities; and (2) expressed indications of acceptance or rejection.

CASE STUDY METHODOLOGY

Initial site selection visits were conducted to determine the sites to be included in the "Case Study." At each selected site, a visitation schedule coinciding with STD events was developed cooperatively with the site coordinator and school superintendent. All three sites permitted a flexible arrangement in which the STD observer could move about without constantly checking with school officials, thus providing the necessary freedom to derive the greatest advantage from each visit's circumstances.

Two data collection modes were used: (1) interviews; and (2) participant observations. The sites were normally visited on a monthly basis to conduct interviews with students in the STD class, with teachers taking the in-service course, and with other school personnel and community people. While present, the observer attended any STD broadcasts occurring during the visit. Observations of community meetings, such as those of the town council and service clubs, were also made.

A check list, consisting of the STD products and services as well as other items needed for interpreting data, was informally constructed by those doing the "Case Study" and was used to guide interviews and observations. A narrative report of each visit's observations and interviews was prepared and became the official record for the "Case Study."

COST STUDY

The "Cost Study" involved three activities: (1) the compilation and presentation of aggregate costs by functional area and an allocation of these costs to major phases of activity; (2) adjustments to the aggregate costs for such items as expenses which were irrelevant to the ultimate Project objectives and results, the reallocation of expenses among line items to reflect more accurately functional costs, and the amortization of equipment purchases; and (3) the allocation of functional costs to the following products: career education programs for junior high students, teacher in-service programs, topical adult evening programs, Materials Distribution Service, operational sites, and operational communications network.

Because of the technical and complex nature of the "Cost Study," the design process has been presented with the discussion and analysis of costs in the section, "Results and Conclusions."

FORMATIVE INSTRUMENTATION FOR ALL EVALUATION

To provide data for operational decisions, to maintain a written communications channel, and to monitor the network support function, a comprehensive data-gathering system was facilitated. Data was returned to the STD on a weekly basis and included:

(1) attendance at STD broadcasts, i.e., the "Time Out" series, in-service training, evening programs, and the Materials Distribution Service;

(2) evaluative ratings for each of the STD products and services by STD site personnel and audience members; and

(3) documentation of the time required for various site tasks by personnel.

The following collection instruments were utilized to gather data described above:

WEEKLY SITE REPORT

This instrument was returned weekly and consisted of: (1) reporting of attendance, programs, support materials, and of contacts with STD observers and non-STD personnel; (2) evaluative judgements regarding the effectiveness of STD broadcasts, support materials, and services; (3) time allocations to various STD and school career education activities; and (4) subjective comments, suggestions, and requests.

IN-SERVICE RATING FORMS

At each in-service broadcast, viewers' subjective judgments regarding the programs were recorded. These judgments were made in terms of the program's appeal, utility, and value for stimulating future action. Program elements were rated and suggestions for improvement and / or comments were solicited.

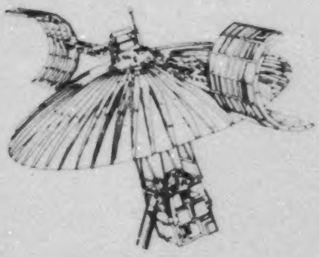
GENERAL AUDIENCE FORMS

At the conclusion of each broadcast of "Footprints," the site coordinator administered the general audience forms to: (1) collect data on the program's acceptance and utility, with specific attention being directed toward the use of interaction; and (2) elicit specific comments and suggestions.

STUDENT LETTERS

Students at participating sites frequently corresponded with members of the Program staff. These letters contained requests for specific job information, addresses, and information sources. The staff responded to all requests either orally during live programs or in writing.

In addition to the above, students and teachers also completed daily and weekly tests on student programming.



RESULTS AND CONCLUSIONS

The Satellite Technology Demonstration successfully fulfilled the Project objectives. The specific results of the STD have been described in this section: the technical performance of the network communications system which proved the feasibility of satellite delivery; the field network which identified user populations, encouraged the use of STD products and services, and facilitated user acceptance; the research analysis of user acceptance and student learning gains which evaluated the acceptability and feasibility of the system; and a cost analysis of the STD products and services which indicates the economic feasibility of the system.

TECHNICAL PERFORMANCE

This section substantiates the exceptional level of equipment performance for the Satellite Technology Demonstration, including:

(1) signal quality, as expressed in both average signal-to-noise ratio and average intelligibility;

(2) hardware reliability, including failure rate of equipment and mean time to repair failures; and

(3) operational ease, indicated by the level of performance and attitude of the user.

Successful operational experience by the STD within each of these areas reduces the investment risk of similar endeavors and supports optimistic implications for future satellite communications systems. Results and conclusions in this section have been derived from the data which has been analyzed to date. A continuing analysis is being made under a separate contract with the Office of Telecommunications, Office of the Secretary, DHEW, and the resulting report will be a comprehensive analysis of the entire HET network.

2.5 GHz RECEIVE-ONLY TERMINALS

SIGNAL QUALITY

Sources of data for this section have been listed in Section IV, "Communications Network." An important source of information was the Optical Mark Read (OMR) cards returned by the STD site operators; OMR cards provided a daily log of equipment operation, computer-processed to become a record of performance for the entire network. In addition to recording the signal strength indicated by the meter on the Hewlett Packard receiver, the operator made an evaluation of the quality of both the audio and video. (A combination of objective signal-strength measurements and subjective signal-quality assessments give a superior indication of network performance. Cf: Braum and Hughes, "Studies of Correlation between Picture Quality and Field Strength in the United States," **Proc. of the IRE**, pp. 1050-1059, June, 1960.) The audio signal was rated for readability (intelligibility) and signal strength (volume) on a three-point scale with "3 × 3" representing a "good" or "excellent" signal. Video reporting employed a five-point scale for evaluating noise perception in the picture and the degree to which it was found distracting. A "5 × 5" rating indicated imperceptible noise (which was not annoying); in the opinion of the operator, the picture was excellent.

TABLE 11

Signal Strength During a Six-Month Period
2.5 GHz Receive-Only Terminals

		RME (N) NORTH EAST	RME (S) SOUTH EAST	RMW (N) NORTH WEST	RMW (S) SOUTH WEST	ALL
	OCTOBER 1974					
HP METER	# RESPONSES	316	289	259	184	1048
	MEAN	17.29 dB*	19.01 dB	15.31 dB	17.45 dB	17.30 dB
	STANDARD DEVIATION	2.98 dB	3.92 dB	3.39 dB	2.81 dB	3.60 dB
	MEDIAN	18.03 dB	19.68 dB	15.74 dB	17.85 dB	17.74 dB
	NOVEMBER 1974					
HP METER	# RESPONSES	325	273	279	138	1015
	MEAN	17.28 dB	18.53 dB	14.82 dB	17.69 dB	17.00 dB
	STANDARD DEVIATION	3.27 dB	3.88 dB	3.39 dB	2.74 dB	3.70 dB
	MEDIAN	18.00 dB	19.48 dB	15.05 dB	17.92 dB	17.55 dB
	DECEMBER 1974					
HP METER	# RESPONSES	268	226	239	122	855
	MEAN	17.40 dB	19.65 dB	15.54 dB	17.83 dB	17.54 dB
	STANDARD DEVIATION	3.29 dB	3.02 dB	2.29 dB	2.09 dB	3.20 dB
	MEDIAN	18.11 dB	19.87 dB	15.28 dB	18.04 dB	17.79 dB
	JANUARY 1975					
HP METER	# RESPONSES	362	311	308	161	1142
	MEAN	17.01 dB	19.20 dB	15.28 dB	17.80 dB	17.25 dB
	STANDARD DEVIATION	3.27 dB	3.76 dB	3.39 dB	2.08 dB	3.62 dB
	MEDIAN	17.39 dB	20.09 dB	15.20 dB	17.66 dB	17.47 dB
	FEBRUARY 1975					
HP METER	# RESPONSES	347	307	316	174	1144
	MEAN	17.50 dB	19.09 dB	15.22 dB	18.09 dB	17.39 dB
	STANDARD DEVIATION	2.85 dB	3.86 dB	3.61 dB	2.19 dB	3.60 dB
	MEDIAN	17.73 dB	19.95 dB	15.42 dB	18.50 dB	17.72 dB
	MARCH 1975					
HP METER	# RESPONSES	308	253	269	154	984
	MEAN	17.38 dB	19.04 dB	15.62 dB	17.84 dB	17.40 dB
	STANDARD DEVIATION	2.16 dB	3.54 dB	3.21 dB	3.31 dB	3.29 dB
	MEDIAN	17.56 dB	19.90 dB	15.68 dB	19.21 dB	17.62 dB
	ALL SIX MONTHS					
HP METER	# RESPONSES	1926	1659	1670	933	6188
	MEAN	17.30 dB	19.07 dB	15.29 dB	17.78 dB	17.31 dB
	STANDARD DEVIATION	3.00 dB	3.72 dB	3.28 dB	2.59 dB	3.52 dB
	MEDIAN	17.78 dB	19.82 dB	15.37 dB	18.15 dB	17.65 dB

*Decibels

TABLE 12
Six Month Comparison of Intelligibility Comments, Weather Conditions, and Hewlett Packard Signal Strength

VIDEO INTELLIGIBILITY COMMENT	5 × 5	4 × 5	4 × 4
# RESPONSES	4907	231	444
MEAN	17.63	17.96	15.80
STANDARD DEVIATION	3.33	2.36	2.99
MEDIAN	17.93	18.38	16.32

AUDIO INTELLIGIBILITY COMMENT	3 × 3
# RESPONSES	5476
MEAN	17.60
STANDARD DEVIATION	3.21
MEDIAN	17.83

TEMPERATURE	GREATER THAN 80°	51-80°	31-50°	1-30°	BELOW 0°
# RESPONSES	18	732	2887	2310	213
MEAN	13.83	17.29	17.10	17.51	18.46
STANDARD DEVIATION	2.75	3.47	3.55	3.46	3.29
MEDIAN	13.50	17.42	17.42	17.89	18.72

CLOUDS	NO CLOUDS	MODERATE CLOUDS	HEAVY CLOUDS
# RESPONSES	3315	1570	1273
MEAN	17.54	17.05	17.06
STANDARD DEVIATION	3.59	3.44	3.34
MEDIAN	17.92	17.20	17.45

WIND	NO WIND	MODERATE WIND	HEAVY WIND
# RESPONSES	5036	952	92
MEAN	17.38	17.38	17.27
STANDARD DEVIATION	3.49	3.41	3.06
MEDIAN	17.78	17.30	17.36

RAIN	NO RAIN	MODERATE RAIN	HEAVY RAIN
# RESPONSES	5768	253	42
MEAN	17.44	16.19	15.45
STANDARD DEVIATION	3.47	3.12	4.12
MEDIAN	17.79	16.05	16.06

SNOW	NO SNOW	MODERATE SNOW	HEAVY SNOW
# RESPONSES	5128	707	239
MEAN	17.40	17.13	17.38
STANDARD DEVIATION	3.47	3.49	3.64
MEDIAN	17.76	17.29	17.59

ICE	NO ICE	MODERATE ICE	HEAVY ICE
# RESPONSES	5308	656	154
MEAN	17.41	16.60	17.90
STANDARD DEVIATION	3.42	3.95	3.46
MEDIAN	17.74	16.87	18.21

Mean, Standard Deviation, and Median are in Decibels

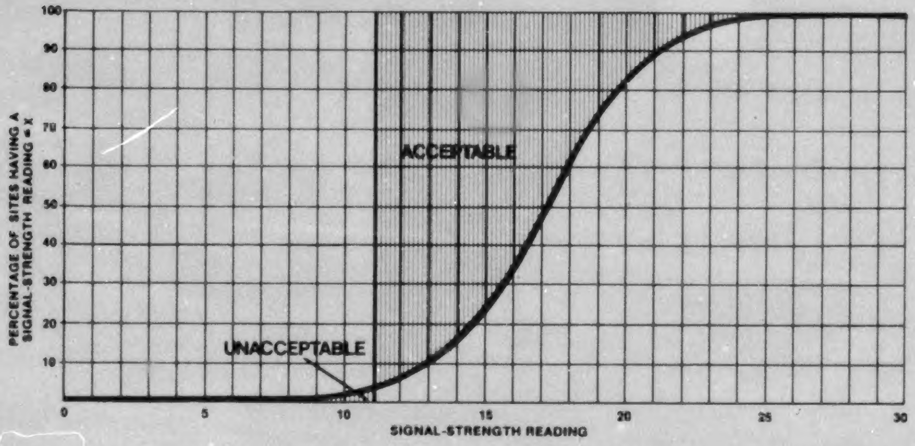


FIGURE 11
HP Signal Strength Readings

Analysis of data showed that the signal quality received by the specially engineered 2.5 GHz Receive-Only Terminals exceeded the design specifications. The average signal strength at all sites for each month and cumulatively during the period October, 1974, to March, 1975, was 17 dB (design specification required 11 dB or above; see Table 11). A comparison of the four beams for the six-month period indicated that: (1) the strength of the signal was greatest in the Rocky Mountain Southeast (RMSE) area, with an average reading of 19.07 dB; (2) the lowest signal strength occurred in the Rocky Mountain Northwest (RMNW) area, with an average of 15.29 dB; and (3) the Rocky Mountain Northeast (RMNE) and Rocky Mountain Southwest (RMSW) areas recorded mean readings at 17.30 dB and 17.78 dB, respectively. Two facts may explain the slight differences noted in these comparisons. First, the greatest number of sites located on the periphery of a beam were in RMNW. Secondly, the greatest density of sites located closest to beam center was in RMSE.

Temperature had no significant impact on signal strength. (Referring to Table 12, a degradation in received signal strength was reported for temperatures above 80° F. However, this data came from two peripheral sites which had these same low mean readings for all temperatures.)

The effect of weather conditions on signal reception has been shown in Table 12. Mean evaluation of noise at 15.80 dB was "4 × 4" (barely perceptible and only slightly annoying). When snow or ice accumulated in the antenna, there was degradation of signal strength and quality, and rain appeared to have some adverse effect on signal strength. (This data was observed by STD engineers but was never reported by site operators on the OMR cards. This data has not been reflected in the results of Table 12.)

TABLE 13

Signal Quality

Summary of Conclusions:
2.5 GHz Receive-Only Terminals
Based on Data Between
October, 1974, and March, 1975.

HP SIGNAL STRENGTH READINGS	
MEAN	17.31 dB
STANDARD DEVIATION	3.52 dB
MEDIAN	17.65 dB

VIDEO INTELLIGIBILITY	
MEAN	5 BY 5

AUDIO INTELLIGIBILTIY	
MEAN	3 BY 3

DESIGN ADEQUACY*	
(THRESHOLD CURVE SET AT 11 dB)	98%

WEATHER IMPACT	
TEMPERATURE	NONE
CLOUDS	NONE
WIND	NONE
RAIN	REDUCTION IN SIGNAL STRENGTH (PROBABLE HUMAN FACTOR) NO IMPACT ON SIGNAL QUALITY
SNOW	NO IMPACT OBSERVED (SNOW WAS CLEARED FROM PARABOLA)
ICE	NO IMPACT OBSERVED

SIGNAL-TO-NOISE RATIO	
(WEIGHTED PEAK-TO-PEAK VIDEO TO RMS NOISE)	> 49 dB, 99%

COLOR FIDELITY	
PHASE	WITHIN ± 2.5°
AMPLITUDE	WITHIN ± 4%
ASSOCIATED AUDIO	> 44 dB, 99%

*Design adequacy is the probability that the system will successfully accomplish its mission, given that the system is operating within design specifications.

However, these conclusions concerning the effects of precipitation should be qualified since the human factor must be considered. Operators may have been reluctant to make outdoor antenna adjustments during adverse weather and may have accepted (and reported) a less than optimum signal strength reading.

The signal strength recorded at all stations exceeded design specifications (11dB) 98 percent of the time (indicated in Table 13), confirming the excellent performance level attained by the ROT equipment.

EQUIPMENT RELIABILITY

The equipment failure rate was defined as the ratio of the number of hours of programming missed due to equipment malfunction to the total number of program hours available. The failure rate of ROT equipment at all sites in the STD was found to be less than 1.1 percent (i.e., the ROT terminals in the system were operational more than 98.9 percent of the program time). The mean time required to repair an ROT equipment failure was 24 hours and the program loss due to technical failure was one program or less.

The foregoing evaluation of ROT performance did not include peripheral equipment (e.g., television monitors and video recorders), maintenance of which were the responsibility of the sites.

VHF/TX/RX TERMINALS

SIGNAL QUALITY

An evaluation of the reliability and performance of the STD voice and data system which operated over ATS-3 should be made with an understanding of the deficiencies inherent in the system. Both the ATS-3 and ATS-1 (used by Alaska) had been in space more than five years past their two-year design life. Further, to conserve power, the ATS-3 (which was being used concurrently for other NASA experiments) was operated at half power during portions of the Demonstration. VHF frequencies in the band allocated to the STD are heavily used, especially by commercial traffic in urban areas and are subject to interference from other users and from ionospheric disturbances.

The DUT was equipped with 300-Watt transmitters, whereas at the sites, it was too costly to install transmitters larger than 90-Watts. Therefore, the signal received at Denver was weaker than that transmitted to the sites. An inherent characteristic of the satellite transponders used by the VHF system causes a slightly stronger signal (which may have originated from an interfering source) to dominate and blank out a weaker one. In addition, measurements and tests made after early difficulty with the system revealed that signals from the remote transmitters were tuned as much as 1 KHz off center frequency and were not always fully modulated because the users were too far away from the microphone or spoke too softly. On-site adjustments of frequency and power output improved operations in some cases.

The results of the OMR-card VHF signal quality reports have been summarized in Table 14. It should be noted that 96 percent of all reports are "3 × 3," the highest report possible, reflecting the sites' consistently good reception of NCC transmissions with the 300-Watt transmitter.

TABLE 14
VHF Signal Quality Reports

SITE #	NAME	NO. OF VALID REPORTS 3 × 3 × 1	3 × 2 × 1	2 × 3 × 1	2 × 2 × 1	1 × 1 × 2
11	HAYDEN	60				
12	McNARY	48			3	
13	TUBA CITY	77		1	1	
21	MEEKER	21	1	2	3	
22	MONTE VISTA	81		1	1	
23	MONTROSE	68			1	
31	CHALLIS	3				
32	LAPWAI	132	5	1	4	
33	McCALL	97		1	3	
41	BUSBY	144		1	1	
42	COLSTRIP	105		9	3	
43	FT. BENTON	74			2	
51	CARLIN	43			4	
52	McDERMITT	60				
53	OWYHEE	86				
61	CUBA	93		2		
62	DULCE	80				
63	PENASCO	68		2	5	
71	BLANDING	78			1	1
72	ENTERPRISE	91		1	3	
73	HEBER	48				
81	PINEDALE	69		1	3	
82	RIVERTON	93		2		
83	SARATOGA	99		4	2	
	TOTALS	1818	6	28	40	1

While transmissions received at remote sites showed consistently usable quality, transmissions received at NCC from remote sites were of marginal quality for a significant portion of the time the system was in use. (Up to 18 percent of these transmissions were inaudible on some days. Cf: Dale, J. B., "The Use of a Satellite Interactive System in Conjunction with a Satellite Media Distribution System," April, 1975.) However, the system was useful for maintaining communications with the sites. Had the original frequency request (2.25 GHz) been granted to permit the use of two-way voice communications over the same satellite used by the video programming, the interactive system would have been more useful, and engineering and field costs would have been substantially reduced.

HARDWARE RELIABILITY

The data on VHF equipment reliability was taken from the log of sites reporting downtime. It was measured in days, rather than program intervals, because failure data was available in that format and because the equipment was essentially available, though not used, on an around-the-clock basis. Included in the data are a number of instances which involved problems associated with atmospheric conditions and operator error. (See Table 15.)

TABLE 15

Occurrences of VHF Equipment Failures

	NO. OF DAYS DOWN					
FAILURE TYPE:	1	2	3	4	5	6
ENABLE BUTTON	3	2	2			
ANTENNA ALIGNMENT	2		1			
TRANSMITTER ALIGNMENT	6	1	1		1	
POOR RECEPTION	4					1
CONNECTOR	1		1		1	
PREAMP (ANTENNA)		1	1			
PREAMP (MIKE)	1					
DIGITAL COORDINATOR	1	2				
ENABLE LAMP	1					
FAN	1					
OPERATOR ERROR	5					
OTHER, UNDETERMINED FACTORS	3				1	
TOTALS	28	6	6	0	3	1

DIGITAL SIGNALS

Remote terminal VHF digital capabilities originally planned to complement program services were used only for brief periods of testing. There were a number of reasons for the transmission of digital data not being routinely employed: (1) The decision to use VHF was late; (2) procurement of the field radio equipment was not under the control of the B & E staff; and (3) a delivery delay of approximately three months was encountered. This delay held up the engineering of vital modifications to the equipment as well as the design and testing of associated NCC equipment. The design of the equipment modifications encountered further problems, and testing of the system was postponed until the operational period. An additional problem was the delay in the design of the computer software.

The digital coordinator did perform the function of a VHF control panel (by selecting the operating mode and frequency and by keying the transmitter), but the unavailability of the computer system made it impossible to enable the remote transmitters upon command from Denver. As a result, a push button attached by epoxy to one of the circuit boards in the back of the remote digital coordinator had to be activated by the operator. In addition to the inconvenience to the operator (who had to open the back of the equipment and push this button before each transmission), the buttons began breaking off the circuit board after a period of use.

A data transmission test performed for NASA toward the end of the programming year was very successful. This and other brief but successful tests proved that a fully operational digital system would have greatly enhanced both the capabilities and effectiveness of the VHF network.

THE SITE OPERATOR

For the "Site Operator Study," the experience and capabilities of the site operators prior to the STD project were identified to establish a basis for evaluating the training program. Although engineering proficiency was not a prerequisite for being a site operator, the following factors were sequentially evaluated during the course of the Project: (1) training; (2) initial results of the training program; (3) site operator performance throughout the Demonstration; and (4) operators' dispositions toward the hardware configuration.

SITE OPERATOR PROFILE

A survey, the **Site Operator Profile**, was used to identify those factors which were likely to influence quality of performance during the Project. Three factors were selected: interest, training, and capabilities in technology, particularly communications equipment. The results from the survey items designed to measure these factors have been summarized in Table 16.

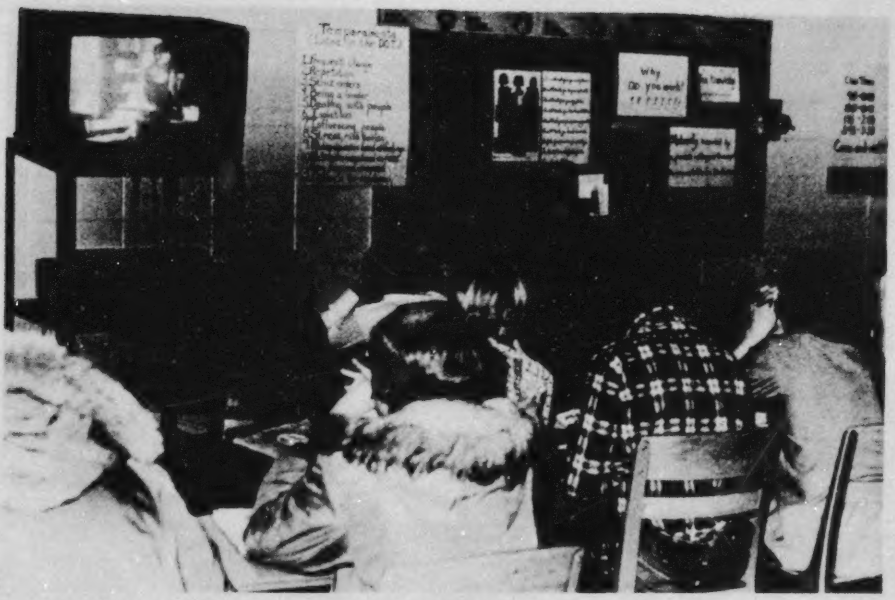


TABLE 16
Site Operator Profile

	IT'S	ROT'S	ALL SITES
# RESPONSES	21	31	52
QUESTION 1:			
HOBBIES (SPECIAL INTEREST)			
--	--	--	--
% PHOTOGRAPHY	52.38	64.52	59.62
% MACHINE REPAIR	52.38	58.06	55.77
% AUDIO SYSTEMS	57.14	41.94	48.06
% SHORTWAVE RADIO	19.05	6.45	11.54
% OF THE ABOVE SHORT-WAVE RADIO WITH FCC LICENSE	(75.00 OF ABOVE)	--	(50.00 OF ABOVE)

	IT'S	ROT'S	ALL SITES
	21	31	52
QUESTION 2:			
TRAINING			
% ELECTRONICS	85.71	77.42	80.77
% PHOTOGRAPHY	33.33	16.13	23.08
% MECHANICS	14.29	32.26	25.00
% AUDIO VISUAL SYSTEMS	66.67	67.74	67.31
% TWO-WAY RADIO	28.57	22.58	25.00

TABLE 16 (continued)

	IT'S	ROT'S	ALL SITES
# RESPONSES	21	31	52
QUESTION 3: SELF-PERCEIVED CAPABILITIES			
A-V PROJECTORS			
% HIGH CAPABILITY	52.38	61.29	57.69
% MODERATE CAPABILITY	38.10	35.48	36.54
% LOW CAPABILITY	4.76	3.23	3.85
% NO CAPABILITY	4.76	--	1.92
A-V RECORDING			
% HIGH CAPABILITY	57.14	35.48	44.23
% MODERATE CAPABILITY	28.57	48.39	40.38
% LOW CAPABILITY	4.76	6.45	5.77
% NO CAPABILITY	9.52	9.68	9.62
OFFICE MACHINES	4.76	10.00	7.84
% MODERATE CAPABILITY	38.10	30.00	33.33
% LOW CAPABILITY	42.86	40.00	41.18
% NO CAPABILITY	14.29	20.00	17.65
COPIERS			
% HIGH CAPABILITY	47.62	45.16	46.15
% MODERATE CAPABILITY	42.86	41.94	42.31
% LOW CAPABILITY	4.76	6.45	5.77
% NO CAPABILITY	4.76	6.45	5.77
PHOTO EQUIPMENT			
% HIGH CAPABILITY	30.00	6.67	16.00
% MODERATE CAPABILITY	25.00	36.67	32.00
% LOW CAPABILITY	10.00	46.67	32.00
% NO CAPABILITY	35.00	10.00	20.00
TELEGRAPH EQUIPMENT			
% HIGH CAPABILITY	5.00	5.33	4.00
% MODERATE CAPABILITY	25.00	6.67	1400
% LOW CAPABILITY	10.00	16.67	14.00
% NO CAPABILITY	60.00	73.33	68.00
TWO-WAY RADIO			
% HIGH CAPABILITY	15.00	3.33	8.00
% MODERATE CAPABILITY	30.00	20.00	24.00
% LOW CAPABILITY	20.00	30.00	26.00
% NO CAPABILITY	35.00	46.67	42.00

Prior to STD affiliation, approximately 50 to 60 percent of all site operator responses indicated a special interest in photography (59.6 percent), and/or machine repair (55.8 percent), and/or audio systems (48 percent), with a similar distribution of responses between Intensive Terminals (IT) and Receive-Only Terminals (ROT). "Mechanics" was defined as "automotive, household appliances, small machine repairs, etc." Only a small percentage (11.5 percent) had special interest in shortwave radio, the percentage being somewhat higher for IT operators than for ROT operators (19.0 percent versus 6.4 percent). These results indicate no special ability with communications equipment among most of these people before STD affiliation.

Eighty percent of the respondents had some training in electronics and 67.3 percent had some training in audio-visual systems. Smaller percentages of the respondents indicated training in other categories, including two-way communications in which 25 percent had some training.

A sizable percentage of the respondents indicated capabilities with audio-visual projectors (57.7 percent "high capability" and 36.5 percent "moderate capability") and audio-visual recording equipment (44.2 percent "high capability" and 42.3 percent "moderate capability"). A smaller number indicated capability with photographic equipment (only 6.7 percent "high capability" and 36.7 percent "moderate capability"). A few respondents indicated "high capability" with office machines, telegraphic equipment, and two-way radio equipment. The greatest percentages of "low" or "no capability" responses were in the telegraph and two-way radio equipment categories.

Based on these results, conclusions were drawn about those people surveyed concerning their experiences prior to the STD project. Although a large percentage of persons indicated special interest, training, and capability relative to familiar types of technological equipment—an equally sizable percentage indicated no special interest, training, or capability relative to the same or other types of technological equipment. Furthermore, most had no special interest, training, or capability in using communications equipment.

SITE OPERATOR TRAINING

Nine state coordinators, one from each of seven states and two from Nevada, underwent a two-day technical training session in Denver and were given a written examination. Of the 50 multiple-choice questions in Part I, none answered more than 8 incorrectly; of the 20 true/false questions in Part II, none answered more than 4 incorrectly. Analysis indicated that incorrect answers were evenly distributed among the various questions, with no question receiving more than 5 incorrect answers. Upon completion of the training program and observation of their performance with STD equipment, the state coordinators were evaluated as competent to train site operators at the local level.

Although the site operator training was, by necessity, of short duration, a sampling of the results of the technical examination (which was also administered to local operators) indicated that there were no more than 7 incorrect responses in Part I and 4 in Part II. Again, there was an even distribution of incorrect responses among the questions. The results of this written examination indicated that the training by the state coordinators had been sufficient to prepare site operators to operate the STD equipment; however, the level of performance of the site operators during the first month of operation indicated that the time used for their training and practice with the equipment should have been greater.

SITE OPERATOR PERFORMANCE

One month of operation was required to bring the site operators' reporting and equipment performance into conformity with the predefined procedures. Problems included improper use of equipment and incorrect reporting. Because of the nature of the deficiencies during September, 1974, it was difficult to assign specific percentages to adequate and inadequate site operator performance. However, estimates probably are not far from accurate. From the OMR reports it was concluded that, from the onset of operations, approximately 50 percent of the site operators sufficiently and effectively understood and performed all Broadcast and Engineering tasks. From the OMR reports and the additional sources of Utilization, the Repair Supervisor, Research, and NCC, it was estimated that: (1) 25 percent of the site operators, for the first month of operations, did not totally understand Broadcast and Engineering procedures; and (2) an additional 25 percent had reporting difficulties but it was unclear whether they understood Broadcast and Engineering procedures. (Regarding the state of the equipment at remote sites during the month of September, 1974, it should be noted that hardware-caused malfunctions involved less than one percent of all remote sites.)

As a result of site operation problems during the first month of programming in September, 1974, B & E repair support was hampered and there were delays in repair service; also, the technical data needed for operation and cumulative evaluation were questionable and unreliable. Therefore, the beginning of technical evaluation was postponed until October 7, 1974.

To improve site-operator performance, Broadcast and Engineering adopted a series of remedial strategies, including memoranda, operational briefings, and phone conversations. Thereafter, from October 7, 1974, to February 28, 1975, site operator performance improved in all aspects of operations, including equipment operation, NCC reporting procedures, and OMR reporting. From October 7 to October 26, 1974, operator error accounted for less than one percent (.8 percent) of broadcast downtime, with a steady decrease in operator error thereafter. Causes for operator error during the time after October 26, 1974, were traced to absenteeism and operation of equipment by substitute personnel. Only one site operator (because of illness) was unable to perform Broadcast and Engineering tasks adequately.

With improved operator performance (after September, 1974) and improved network discipline, the situation reversed itself. B & E repair support services were improved; the technical data were accurate and reliable, and, therefore, valuable for diagnostic and analytic purposes; and NCC coordination became a simple and efficient task.

SITE OPERATOR PREFERENCE AND OPINION POLL

The **Preference and Opinion Poll** was designed to reveal the disposition of the users at various times throughout the Demonstration. Two questions were used to identify the users' points-of-view about overall operational ease of equipment, operational procedures, and hardware data-gathering requirements.

TABLE 17

Preferences and Opinion Poll (STD Survey, 11/74)

		IT'S			ROT'S			ALL SITES		
	# RESPONSES		21			31			52	
EQUIP USE	EQUIP EASY TO USE MEAN # ON SCALE FROM 1 TO 5*	4.81			4.77			4.79		
	% STRONGLY AGREE		80.95	100%		77.42	100%		78.85	100%
	% AGREE		19.05			22.58			21.15	
	% NEUTRAL		0			0			0	
	% DISAGREE		0			0			0	
	% STRONGLY DISAGREE		0			0			0	
EQUIP USE AND OPERAT. PROC.	EQUIPMENT INTERESTING MEAN # ON SCALE FROM 1 TO 5*	4.62			4.61			4.62		
	% STRONGLY AGREE		66.67	95.24%		70.97	96.78%		69.23	96.15%
	% AGREE		28.57			25.81			26.92	
	% NEUTRAL		4.76			0			1.92	
	% DISAGREE		0			0			0	
	% STRONGLY DISAGREE		0			3.23			1.92	
	EQUIP CHECKS EASY TO DO MEAN # ON SCALE FROM 1 TO 5*	4.65			4.42			4.51		
	% STRONGLY AGREE		70.00	95%		61.29	87.10%		64.71	90.20%
	% AGREE		25.00			25.81			25.49	
	% NEUTRAL		5.00			9.68			7.84	
	% DISAGREE		0			0			0	
	% STRONGLY DISAGREE		0			3.23			1.96	
OPERAT. PROC. & DATA REQUIRE.	OMR'S EASY TO DO MEAN # ON SCALE FROM 1 TO 5*	4.52			4.57			4.55		
	% STRONGLY AGREE		61.90	90.47%		60.00	96.67%		60.78	94.31%
	% AGREE		28.57			36.67			33.33	
	% NEUTRAL		9.52			3.33			5.88	
	% DISAGREE		0			0			0	
	% STRONGLY DISAGREE		0			0			0	

*Scale

5	4	3	2	1
Strongly Agree				Strongly Disagree

EQUIPMENT USE, OPERATIONAL PROCEDURES, AND HARDWARE DATA—GATHERING REQUIREMENTS

The results of the poll (see Table 17) indicate that 100 percent of the respondents found the equipment easy to use ("agree" or "strongly agree"), that 90 percent or more in each category felt that operations and procedures were interesting and easy, and that procedures and data requirements (specified in the **Broadcast and Engineering Manual for HET Site Operators**) were easy to meet. The mean for all categories of these survey questions, on a scale from 1 ("strongly disagree") to 5 ("strongly agree"), was 4.4.

Based on these results, it was concluded that STD site operators were well disposed toward equipment usage, procedures, and engineering data-gathering requirements. The 3.2 percent of ROT operators who found equipment checks difficult were working at unusual installations where an equipment item (the Hewlett Packard receiver) was not easily accessible (e.g., in another room in the building or a few miles distant on a mountaintop).

PARABOLA ADJUSTMENTS

Occasional antenna adjustments were necessary to accommodate changes in the orbital position of ATS-6. Elevation adjustments tilted the parabola up or down and were made manually (or electrically if the parabola was motorized) by rotating the elevation rod supporting the top of the antenna. The manual adjustment had to be made outdoors at the antenna; the motorized adjustment could be made indoors with a toggle switch which was located near the Hewlett Packard receiver.

Azimuth adjustments (i.e., pointing the antenna left or right relative to the satellite position) could only be made manually and required considerable physical strength. Adjustments required the site operator to loosen the nuts in three main areas on the base of the parabola support structure (two which secured the front yoke and one on the elevation mechanism); and to then rotate the parabola left or right while observing the remote signal strength meter. A lever was helpful in moving the antenna. Azimuth adjustments were not frequently required.

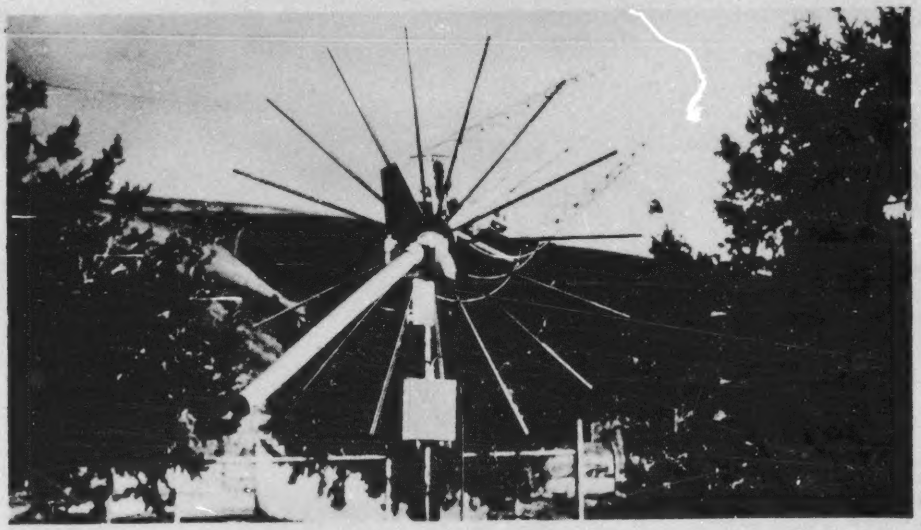


TABLE 18

Ease of Antenna Adjustment Survey 11/74

	ELEVATION ADJ'S					
	WITH MOTORS		WITHOUT MOTORS		BOTH TYPES ALL RESPONSES	AZIMUTH ADJ'S ALL SITES
# RESPONSES	19		33		52	52
# DAYTIME ADJ'S MEAN # ADJ'S/WK	1.67		1.18		1.35	.38
% ZERO PER WEEK	27.78		48.48		41.18	78.00
% ONE PER WEEK	27.78	72.23%	18.18	51.41%	21.57	18.00
% TWO PER WEEK	16.67		18.18		17.65	0
% THREE PER WEEK	16.67		6.06		9.80	0
% FOUR OR MORE/WK	11.11		9.09		9.80	4.00
# NIGHTTIME ADJ's MEAN # ADJ'S/WK	1.78		.87		1.20	.39
% ZERO PER WEEK	0		35.48		22.45	79.59
% ONE PER WEEK	50.00	100%	45.16	64.52%	46.94	8.16
% TWO PER WEEK	33.33		16.13		22.45	8.16
% THREE PER WEEK	11.11		3.23		6.12	2.04
% FOUR OR MORE/WK	5.56		0		2.04	2.04
EASY ADJ MEAN # ON SCALE FROM 1 TO 5*	4.00		3.97		3.98	3.33
% STRONGLY AGREE	47.37	84%	48.48	70%	48.08	28.89
% AGREE	36.84		21.21		26.92	20.00
% NEUTRAL	0		15.15		9.62	22.22
% DISAGREE	0		9.09		5.77	13.33
% STRONGLY DISAGREE	15.79		6.06		9.62	15.66

*Scale

5	4	3	2	1
Strongly Agree				Strongly Disagree

TABLE 19

Ease of Antenna Adjustment Survey 4/75

	ELEVATION ADJ'S		
	WITH MOTORS	WITHOUT MOTORS	BOTH TYPES: ALL RESPONSES
# RESPONSES	43	11	24
# DAYTIME ADJ'S MEAN # ADJ'S/WK	1.00	.50	.90
% ZERO PER WEEK	58.54	60.00	58.82
% ONE PER WEEK	12.20	30.00	15.69
% TWO PER WEEK	12.20	10.00	11.76
% THREE PER WEEK	9.75	0	7.84
% FOUR OR MORE/WK	7.32	0	5.84
# NIGHTTIME ADJ'S MEAN # ADJ'S/WK	.95	.56	.88
% ZERO PER WEEK	30.17	55.56	35.42
% ONE PER WEEK	48.72	33.33	45.83
% TWO PER WEEK	17.95	11.11	16.67
% THREE PER WEEK	0	0	0
% FOUR OR MORE/WK	2.56	0	2.08
ELEV EASY ADJ MEAN # ON SCALE FROM 1 TO 5*	4.60	3.27	4.33
% STRONGLY AGREE	65.12	0	51.85
% AGREE	30.23	72.73	38.89
% NEUTRAL	7.65	0	3.70
% DISAGREE	0	9.09	1.85
% STRONGLY DISAGREE	0	18.18	3.70

AZIMUTH ADJ'S ALL SITES	54
# OF TOTAL ADJ'S	
ZERO	4.74%
ONE	33.96%
TWO	11.32%
THREE	15.09%
FOUR	7.55%
TEN OR MORE	20.75%
AZIMUTH EASY ADJ MEAN # ON SCALE FROM 1 TO 5*	3.47
% STRONGLY AGREE	32.56
% AGREE	23.26
% NEUTRAL	20.93
% DISAGREE	4.65
% STRONGLY DISAGREE	18.60

*Scale

5	4	3	2	1
Strongly Agree				Strongly Disagree

Referring to Tables 18 and 19, the following conclusions concerning antenna adjustments can be drawn from surveys of site personnel conducted in September, 1974, and April, 1975:

1. The operators at most sites, with or without electric elevation motors, thought the elevation adjustments were easy.
2. Antennas with motorized elevation were adjusted more frequently than those without.
3. Evening elevation adjustments were required more often than were daytime adjustments. (At many STD sites, evening programs could not be received unless the elevation of the antenna was changed.)

The results of the data provided in the last survey (April, 1975) show that 34.0 percent of the site operators made no azimuth adjustments from September to April; 11.3 percent made one adjustment during that period of time; 15.1 percent made two such adjustments; and 7.6 percent made three adjustments. In addition, 55.8 percent of the operators thought azimuth adjustments were easy ("agree" or "strongly agree"); 20.9 percent were neutral in opinion; and 23.2 percent found such adjustments difficult ("disagree" or "strongly disagree").

STD installation and maintenance personnel found that azimuth adjustments required a great deal of strength and in some instances it was almost impossible to swing the parabola. For this reason, it was assumed that people having neutral opinions or those who found azimuth adjustments easy were either not performing this task or did so infrequently.

Consequently, because of the high quality of signal reception throughout the Project, two interrelated conclusions were drawn:

1. At most STD sites, it was unnecessary to make more than one or two azimuth adjustments throughout the Demonstration.
2. A small number of installations which were close to beam edge needed to make more frequent azimuth adjustments (about once every month) for satisfactory signal reception.

VHF TRANSMITTER RECEIVER SYSTEM

By operation of a single, inclusive indoor unit— the VHF Communications Console—the site operator received voice messages and transmitted voice and data information. The Console was operated by simple on/off switches and push-button controls, with indicator lights providing additional assistance.

The Console was designed to serve as an all-inclusive and simple-to-operate device for performing reception and transmission functions. User-data indicating its ease of operation have been provided in Table 20.

TABLE 20

VHF Communications Console
STD Survey, November, 1974

# RESPONSES		21
EASY TO USE		
MEAN # ON SCALE FROM 1 TO 5*	4.76	
% STRONGLY AGREE		76.19
% AGREE		23.81
% NEUTRAL		0
% DISAGREE		0
% STRONGLY DISAGREE		0
INTERESTING TO USE		
MEAN # ON SCALE FROM 1 TO 5*	4.57	
% STRONGLY AGREE		71.43
% AGREE		23.81
% NEUTRAL		0
% DISAGREE		0
% STRONGLY DISAGREE		4.76

APRIL, 1975

# RESPONSES		24
EASY TO USE		
MEAN # ON SCALE FROM 1 TO 5*	4.71	
% STRONGLY AGREE		70.83
% AGREE		29.17
% NEUTRAL		0
% DISAGREE		0
% STRONGLY DISAGREE		0
INTERESTING TO USE		
MEAN # ON SCALE FROM 1 TO 5*	4.61	
% STRONGLY AGREE		69.57
% AGREE		26.09
% NEUTRAL		0
% DISAGREE		4.35
% STRONGLY DISAGREE		0

*Scale:	5	4	3	2	1
	Strongly Agree				Strongly Disagree

Surveys indicated that 100 percent of the users thought the VHF Communications Console was easy to operate. Furthermore, most found the VHF equipment interesting to use (95.2 percent in the November, 1974, survey and 95.7 percent in the April, 1975, survey). The ease of operation of the interactive equipment should be considered as a factor contributing to user acceptance of the system.

HET NETWORK COORDINATION

The following is an analysis of the strengths and weaknesses found in the technical mechanisms and administrative procedures used for network coordination. The analysis is primarily concerned with the management coordination function. There were no past experiences for comparison; therefore, the effectiveness of HET coordination was established empirically.

NETWORK COORDINATION CENTER

ATSOCC INTERFACE

The NASA Communications Network (NASCOM) was an efficient and practical system for network coordination which combined both voice and teletype circuits.

MULTI-SIGNAL ROUTING AND MULTI-OUTPUT AND SWITCHING

The NCC's audio and video patch panels were located to provide easy access to audio and video lines and contributed significantly to the efficiency of the network coordination function. In addition to providing signal routing flexibility, the panels also were used for signal diagnosis information.

The audio board and video switcher, although used effectively by NCC operators, could neither simultaneously and automatically transmit audio/video signals nor assure smooth transitions between switching segments.

TELEVISED NETWORK ANNOUNCEMENTS

The character generator used at NCC performed well.

PRE-PROGRAM POLLING

The VHF interaction loop (which permitted NCC to poll all sites in the network) was not always reliable; however, as a management and coordination tool for relay of pre-program data, it was effective. In the case of the three Alaskan experiments, although operators used expert voice protocol, a more relaxed agreement existed with regard to pre-program polling, and inclusive pre-program remote site status was not always provided before programs.

MONITORING

Although digital control of the status of sites displayed on the mapboard was not available throughout the Project, the mapboard was operated manually and proved to be a useful visual monitoring reference which displayed all HET remote stations by location and type of equipment-configuration.

The two color monitors on the mapboard wall were crucial and very effective for operator monitoring of space-segment link status. The black and white monitors were insufficient in number to coordinate system operations.

PROGRAM INTERFACE WITH VA

The dedicated phone line between NCC and the VA program origination center at KMGH-TV in Denver, Colorado, proved a necessary communications link.

FAILURE REPORTING

Because the NCC had the capability to troubleshoot problems at the sites while they were operating, placing the responsibility of coordinating site failure reports with that facility seemed quite logical when the system was developed. Although this procedure had considerable success, there were some difficulties. NCC operators were neither hired nor trained to troubleshoot field equipment; and successful troubleshooting, therefore, depended upon who was operating at the time of a malfunction report. Sometimes site operators used reporting channels other than those specified, which resulted in a less efficient means of communications.

ADDITIONAL INTERFACE

The intercom system and in-house phone extensions were sufficient and useful for coordinating operations.

NETWORK REDUNDANCY

Network failures were of short duration and available backup equipment generally provided adequate network redundancy. However, the verbal agreements with backup sources (such as General Electric in Schenectady, New York) represented an imposition.

VHF DIGITAL CONTROL AND TWO-WAY DATA

The digital equipment in a modified form and associated VHF hardware for field use were integrated and installed on time at the remote sites. The Denver-based digital equipment proved to be far more complicated and difficult to make operational than was expected. The result was a delay in the use of the system.

On April 28, 1975, successful tests of the data acquisition system were run between Denver and Saratoga, Wyoming, using the VHF link with computer control. Similar tests were run through May, 1975. The overall results are encouraging.

STD UPLINK COMPLEX (DUT)

Although little time was available to procure, integrate, and "debug" the DUT, quality of signals and reliability of equipment were exceptional. Broadcast and Engineering's prediction that no catastrophic failure of critical components would occur during the operational phase of the Project proved to be accurate. The DUT was operational 99.6 percent of the time. From October, 1974, through May, 1975, during which time the transmitter was operated, total outages, including power failure and operator error, amounted to 117 minutes. This accomplishment is remarkable given the minimal redundancy built into the system and considering that the operators had no previous experience with satellite earth stations.

CONCLUSIONS

The performance of the HET network coordination system (implemented through NCC and DUT operations) was satisfactory and provided hard data concerning many factors involved in the implementation of a satellite ground system. Given the severe time and budget constraints, choices of equipment were adequate; however, the design and layout of the NCC could have been improved.

INSTALLATION AND MAINTENANCE

INSTALLATION PROCEDURE

In addition to delays in the delivery of ROT apparatus discussed in Section IV, "Procurement," numerous problems with the ROT equipment were experienced:

1. Antenna production was suspended after it was discovered in March, 1974, that the reflector petals developed structural defects after installation.
2. The antenna feeds which were installed initially had the wrong polarity. This problem was discovered in June, 1974, when system tests using the ATS-6 revealed 26 dB of unwanted attenuation. All antenna feeds were replaced within 10 days.
3. Electrical motors to be used to adjust elevation were ordered for 89 of the 119 HET terminals. The first shipment did not arrive until October, 1974, and failed in operation so that no elevation adjustment could be made. It was necessary to return to the field with retrofits to replace the faulty elements.

The modified Intensive Terminals presented several difficulties:

1. They were not available for installation until August, 1974.
2. They did not operate properly when first installed because they were designed to interface with a computer system which had not been installed. It was necessary to return to the field and modify the digital coordinator to permit manual control of VHF transmissions.

As a result of these complications, installation of the STD terminals involved more site visits than originally planned. Only two trips per site were anticipated but as many as eight trips were required to some sites because of procurement delays and design failures. It was sometimes necessary to return to a site to: (1) install fencing; (2) install timbers and mounting hardware; (3) install the ROT antenna and electronics; (4) install the VHF terminal; (5) retrofit the ROT antenna feed; (6) retrofit the digital coordinator; (7) install the motorized elevation unit; and, (8) replace the elevation unit.

Despite the foregoing constraints, all terminals were installed and made fully operational prior to program transmission in September, 1974.

MAINTENANCE PROCEDURES

The Intensive Terminals required the most frequent maintenance, which has been documented in "VHF TX/RX TERMINALS." Site operators occasionally used improper reporting channels, delaying receipt of failure notification, a problem which was particularly prevalent when the normal operator was absent.

The greatest single source of failure reports from the sites was defective peripheral equipment (television monitors and video recorders), the repair of which were not the responsibility of the STD but of the supplier. However, a survey revealed that most users exhibited greater acceptance of problems and greater patience than had been anticipated by the engineering staff, who were more concerned about malfunction problems than were the users.

RECOMMENDATIONS

To augment the effectiveness of a communications network similar to that employed by the STD, the following recommendations are made:

Equipment Design. (1) Cost-performance tradeoffs should be performed before a decision is reached on required equipment reliability. (2) Great care should be given to the design of any equipment which will require frequent on-site adjustment.

Network Coordination Center. (1) If possible, an individual trained to troubleshoot remote equipment malfunctions should be available at all times. (2) Whenever possible, the coordination center should be provided standby tapes when remote origination is scheduled. Formal written agreements among all affected parties specifying conditions for backup should be considered. (3) A computer-controlled network-status board in the coordination center is advisable. (4) Digital polling (rather than two-way voice interrogation) of truth sites provides a faster, more reliable means of determining network status. (5) Locate noisy apparatus (such as teletypes) to minimize the disturbance.

Site Operator Training. (1) Site operators should be trained in troubleshooting and simple maintenance. (2) Substitute site personnel should be trained to perform adequately when the normal operator is absent. (3) Vendors of peripheral equipment should be required to provide effective instruction manuals.

Installation. (1) Whenever possible, travel to sites should be deferred until complete systems are available. (2) A "burn-in" period for all electrical equipment should be considered before field installation. (3) To facilitate maintenance by site operators, connectors should be labeled, and required interface wiring should be well documented.

FIELD IMPACT

The STD field network proved to be an effective support system which solidified state and community support for the Project's services and products. The Project established a human support system throughout the region, ensuring that the Demonstration reflected and responded to community, state, and regional needs. The field support system involved state and local professional and technical specialists, parents, students, and members of the general populace in eight states.

The results and conclusions for Field Services are subjective by design because of the nature of Utilization's role and responsibilities. To determine the impact of the Project's field network, Utilization staff relied on the following subjective sources: (1) monthly state coordinator reports covering in-kind support, problems, task status; (2) debriefing reports from exit interviews with state- and site-level personnel; (3) conversations between Project staff and state- and site-level personnel; and (4) formal and informal observations by professional STD staff.

FIELD IMPACT AT THE STATE LEVEL

IMPACT ON STATE AGENCY GOALS

From the inception of the STD, the Project was sanctioned by the governors' offices as part of the Federation's effort to promote the interests of the region.

The departments of education which sponsored the STD in each state supported not only the concept but also the primary products and services of the Demonstration as a means of enhancing educational programs of the state.

Directors of the state agencies in which state coordinators were employed and housed unanimously supported the organizational procedures, staff supervision, and financial arrangements which had been negotiated by the STD and the state agencies because these three practices:

(1) permitted the state agency to adminster a day-to-day supervisory role over STD state activities;

(2) supported the state's objective of developing career education programs in the schools; and

(3) enabled the state coordinator to maximize the state agency's separate career education resources for planning, delivering field services, and carrying out state and local staff training.

In all states, the agencies covered operational costs which exceeded the STD's basic fiscal year $20,000 grant, through in-kind support and cash expenditures.

State agency personnel had recognized that the STD's programming would further the development of career education curriculum and instruction in the state's schools. State school officers unanimously credited the career education programs as being helpful in implementing career education services in selected schools.

State agency management personnel indicated that the STD helped to strengthen the agency's service relationships with its rural, isolated schools. For example, because each state coordinator was an education generalist, alert to the needs of the schools and the goals of the state agency, the coordinator was able to provide non-STD related resources and support as a part of his-her ongoing STD responsibility. This additional assistance was possible because the coordinator's placement in the state department of education provided access to information on other state department programs of interest to the local schools (bilingual education, reading programs, metric math).

The state agencies participating in the STD accepted the concept of regionalism and its relevance to state-level activities; they recognized the importance of regionalism in projects of the magnitude of the STD and the worth of a regional coordinating organization such as the Federation. They viewed their agency's participation as an opportunity to be part of a promising program which would provide assistance to both state agencies and local sites in developing quality educational services to students and teachers.

IMPACT ON POLICY AND LEGISLATION

Promoting telecommunications policy and legislation was a coordinated effort of the STD and the Federation. The STD assisted the telecommunications commissions of two states in planning new or enlarging existing television network and production facilities. In these states, the STD's function in promulgating state agency policy appears to have been significant. In another state, the STD was requested by the agencies (which were members of the state telecommunications commission) to provide counsel to the commission regarding planning, organization, staffing, and procedures for the use of satellite broadcasting by the state's terrestrial television network.

High priority educational goals must be supported by state appropriations. In the region, funding instructional television has not been a high priority agency goal. In addition, educational priorities are established months in advance of the legislative sessions, creating a significant lag between planning and appropriations for activities designed to achieve agreed-upon goals.

The STD gave technical assistance to one state to further develop its newly formed education television commission. In another state, the STD's signal transmission requirements and its technical support in meeting these requirements aided the state's further expansion of its terrestrial system capabilities by using private and commercial resources. At the same time, the state's terrestrial system expansion plans included satellite-delivered distribution.

IMPACT ON OTHER STATE ORGANIZATIONS

In addition to the sponsoring agency such as the state board of education, other organizations within the states were interested in and became involved with the STD planning and operational activities. For many organizations, the STD represented their first experience in regional planning. These organizations included colleges and universities, state health agencies, vocational educational departments, and public television stations which were interested in the Demonstration because of the relationship of their programs to certain STD activities. For example, to complement the evening "Footprints" series, the STD contacted and involved at least 40 national and regional organizations and private agencies.

The STD generated initial awareness and agency motivation through informational meetings or by responding to agency requests for assistance. Consequently, organizations perceived the STD as a means to obtain operational assistance for specific tasks. Moreover, the Project gave the organizations the opportunity not only to extend their services to new schools but also to extend knowledge of their products and services to new audiences who could become consumers of the agency services.

Involvement in the STD by other state organizations ranged from information sharing and receiving to close participation in the developmental and operational activities of the Demonstration. Through these agencies, instructional television was introduced to small, rural schools, many of whom had had little or no experience with traditional audio-visual materials such as classroom instructional films. For example, through the efforts of public television stations, the STD programming was made available to nearly 17,000 junior high school students in "Open Site" schools.

Commercial agencies were attracted to the STD because they anticipated that an expanded future market would be developed by the STD and its successors. Firms who provided filmic materials were credited in each STD television program and their film guides, catalogs, and teacher guides were distributed by the STD to the rural schools—a market which most instructional materials distributors are able to supply only at high marketing and distribution cost. The primary visual materials and equipment of these agencies were used (often for the first time by the rural schools), resulting in the continued use of the materials and classroom equipment. Both commercial and private enterprises saw the potential benefits accruing to them through the sale of these services and products, e.g., television monitors, video cassette recorders, tape stock, and preproduced films and videotapes.

FIELD IMPACT AT THE LOCAL LEVEL

IMPACT ON SCHOOL DISTRICT POLICY AND GOALS

The impact of the STD on the school districts' policy and goal statements, although difficult to document, is implicit in the activities undertaken and in the operational procedures employed in the participating schools. Furthermore, it is possible that many STD operations will become a formal part of written school board policies.

By signing an agreement ("Site Agreement") with the Federation, the school districts agreed to pursue certain policies for this short-term project. Each site agreed to become part of an eight-state "test bed" in which a new program was implemented in a real world setting. The site committed its facilities, students, and teachers to the STD and provided staff services to perform STD tasks at the local level. This operational commitment could be interpreted as a policy decision on the part of the school boards.

IMPACT ON SCHOOL OPERATIONS AND ADMINISTRATION

Local schools modified their operational procedures to accommodate the use of STD products in the school program. The classes had to be scheduled at a specific time to coincide with the STD broadcast schedules. Some schools adjusted their entire daily schedule or bus schedule to fit the broadcast schedule.

Some districts—with schools located as far as 80 miles from the STD site—used videotapes of programs to provide "Time Out" to their outlying schools. Where this occurred, school personnel traveled to these remote schools to transport the taped programs and to train faculty in the use of programming and the operation of equipment, a time consuming and expensive operation.

The needs of the STD required that local school personnel complete several tasks within demanding time schedules. The school administration made permanent staff assignments to meet these requirements. In the smaller schools, site coordinator activities accounted for as much as one-tenth of available school staff time—a formidable staff and budgetary obstacle. In schools in which staff assignments had not previously included career education instruction, the administration committed the equivalent of one-fourth of an additional staff member to perform STD career development teacher functions.

The schools usually set aside one classroom for the exclusive use of the STD classes, since the STD receiving equipment required a permanent location.

IMPACT ON CLASSROOM EXPERIENCE AND OPERATIONS

The nature of the use of STD programming at the site led to a cooperative arrangement between the Denver-produced programs and the teacher at the local site. This concept was enhanced by providing the site teacher with print support material which described the daily instructional activities and allowed the teacher to know in advance the lesson goals and objectives and the specific content to be presented each day. The extent to which this cooperative effort was used depended on local circumstances.

Where the class period was sufficiently long, the local teacher could conduct follow-up activities. Where class time was limited, the teacher served only as an adjunct to the programming, functioning as a roll-taker, gatherer of data, and equipment operator. Under these circumstances there was insufficient time for teacher evaluation of the instruction, making the STD program less meaningful to the teacher, the students, and the school. There were three Open Site research classes. Additional Open Site schools participated voluntarily in STD programming; however, their ability to be selective provided flexibility in both scheduling and curriculum. These sites used the programming as an adjunct to regular instruction and as a catalyst for local career development curriculum. Selective viewing provided more time for follow-up activities.

Teachers who were involved with the STD at the local level began to emerge as leaders in developing, implementing, and institutionalizing career development education in the school and the school district—a responsibility traditionally vested in the local or district school administrator.

The students in the STD class gained an appreciation of the role which technology plays in the educational process. Students assisted in equipment operation, in classroom presentations, and in promoting community interest—all of which increased their knowledge about various careers.

The knowledge and experience gained from participation in the STD created a cohesiveness among those sites served by the Demonstration. The student population participated in a communication system involving satellites, parabolic antennas, helical antennas, television monitors, and video cassette recorders. Most of this technology was new to the students and generated an increased interest in science which spread to the entire student body.

The direct delivery of services by satellite was viewed as a benefit by both teachers and students. Students did not have to be transported to the nearest vocational or career technical center. Teachers were able to receive university or college credit and/or recertification credit for the in-service training conducted in their own school building rather than having to travel to the nearest university location to attend classes.

IMPACT ON THE COMMUNITY-AT-LARGE

The STD's success in the community is manifested in local attitudes supportive of the Project. For example, community interest in school improvement and in the service aspect of the STD resulted in four STD communities accepting programming through commercial cable or translator facilities—situations which required greater investments of time and effort than was required in those communities receiving the programming directly from the STD via satellite.

IMPACT OF THE STD'S PUBLIC INFORMATION PLAN

OVERALL RESULTS OF THE PI EFFORT

The Public Information staff designed and maintained an accurate flow of information to the media and users, explaining a new and complex use of technology. This information not only facilitated opinion leaders' abilities to make decisions regarding the effectiveness and future applications of the new technology, but also created an awareness by various publics at the local, state, regional, national, and international levels. This awareness resulted in acceptance of the Project's goals as well as support for its accomplishments. Thus when Public Information created an awareness of the STD, understanding of the Project goals and purposes followed.

PUBLIC INFORMATION MATERIALS DEVELOPED AND DISTRIBUTED

Public Information services, identifiable by category and provided during the Project, included:

(1) materials for local site distribution;
(2) materials for general distribution;
(3) special materials—audio and video; and
(4) special or recurring activities.

Materials and techniques which were considered but were not developed included journal articles, articles for regional and national trade publications, state magazines, newspaper advertising, public television station PI grants, and a seminar for PI personnel in state departments of education. Although several staff papers were published nationally, time limitations made it impossible to write as many articles for journals or regional and national magazines as were requested or that the staff desired. The publication of Technical Reports written as part of the final Project summary compensated to some degree for the lack of publication during the operational phases.

One state Project magazine (Nevada) was funded by PI monies, but the magazine concept was not adopted by other states due to varying philosophies on public information and because some states already distributed similar publications. Nevada terminated its state magazine when the first **Satellite Quarterly,** an eight-page newspaper, was distributed in September, 1974.

The effort to "attract and hold" an audience for the evening community programs included leaflets written in English and Spanish. This approach was effective, and had funds been available, other bilingual materials would have been distributed.

The original PI plan included funds for newspaper advertising, but none was purchased. A proposal to provide participating public television stations with direct grants for publicity and promotion was discarded. Project policy regarding the purchase of media time or space was consistent; it was felt that any purchase would negate the legitimate coverage as well as the public service contribution of radio and television stations.

Although a seminar was held for the public information directors of participating public television stations, a similar meeting for PI personnel in state departments of education was cancelled. Funding limits and the knowledge that STD state coordinators were providing information for the state education personnel were reasons for cancelling the meeting.

Management and scheduling of a mobile display was a Public Information responsibility, although this activity was not included in the initial PI plan. The Martin Marietta Company, Denver, manufacturer of the Titan III-C launch vehicle for ATS-6, generated widespread company interest and support for the STD; they built the mobile unit which included an operational receive-only terminal, enabling STD to present live satellite feeds for special audiences. During the final months of the Demonstration the display was not used unless financial support was provided by outside sources because the movement of the mobile van entailed major expense.

VISITORS TO THE STD DENVER OFFICE AND THE SITES

An unanticipated situation developed during the operational year—the influx of visitors. Starting in June, 1974, (after the launch of ATS-6) the STD facility in Denver and some school sites became meccas for visitors. Major amounts of staff time, particularly that of Administration and component directors, were used in meeting with guests. Eventually, a format was developed for these visits: providing a visitor's kit, a briefing by PI personnel, and a viewing session of slide/tape and/or video cassette program material. Actual programs were viewed when schedules allowed, and a facilities tour was arranged; also, interviews with appropriate staff members were set up when possible. Visitors were asked to spend a full day at Project headquarters; however, when their time was limited, a half-day visit was scheduled. Staff at STD were convinced that the Project could not be explained in less time, and to do so was unfair to both the Project staff and the guests.

Public Information coordinated guest visits to school sites with the Utilization staff. Although a site visit policy was drafted, it was not given final approval. Local schools indicated such a policy would be restrictive. Unaccompanied (by Project staff) and unscheduled or unannounced visits to rural school sites were discouraged and care was taken to ensure that particular sites were not overwhelmed by visitors.

ASSESSMENT OF THE IMPACT OF THE PI EFFORT

Data reflecting the effectiveness of the Public Information plan or its implementation are limited. Whether increased awareness and understanding could have been achieved with an increased allocation of resources cannot be determined. The success or failure of the Project was not predicated on "selling" the public. The thrust of the PI plan was to promote and maintain an awareness of the STD; this was accomplished.

ACCEPTANCE AND LEARNING

In the following sections, the findings of seven research studies have been presented. For each study, a summary report has been prepared. The purpose of these summary reports is to present major findings in a distilled form. Each report is organized around the questions the particular study addressed and presents the indicators used to address the questions, an overview of the findings, and where appropriate a discussion of the outcomes.

In addition to these summary reports, a more detailed technical report has been presented for three of the studies. These technical reports have been provided for the reader who is interested in the methodological techniques employed in each study and in a more in-depth review of the comprehensive statistical analyses on which the summary reports were based. Because the data base was massive, time and funding constraints did not allow for the preparation of technical reports for all studies.

In general, the studies focused on two areas of inquiry: (1) gains in career-related knowledge and changes in career-related attitudes among students; and (2) levels of acceptance of the STD and its specific products and services by various groups and changes in acceptance over time. Each study focused on a specific population to gain insight as to what factors might be associated with differences in learning, attitudes, and/or acceptance. The most frequent factors examined were demographic characteristics and type of site.

The population for any given study depended, of course, on the specific questions which the study was designed to address. In considering these populations and their respective samples, four points should be recognized:

1. The study populations were limited to the participating sites and/or selected state officials and should not be considered as representative samples of the Rocky Mountain area as a whole. The site selection processes were not predicated solely on the criterion of area-wide representativeness, and consequently the study populations are site-specific and representative only of themselves.
2. Although each study was based on a sample or subset of the population, operational constraints precluded, in most cases, the use of random or stratified sampling techniques which assure that samples are representative of their respective populations. (These constraints have been discussed in more detail below.)
3. The samples were longitudinal and their composition varied over the course of the studies.

4. Since random sampling procedures were not used to select members of the tested populations, statements regarding the applicability of the results to other populations cannot be made. However, it was felt that the use of selected inferential statistics, such as the t-test, could yield insights regarding the larger universe if the assumption was made that the STD population was representative of that larger universe.

The Student Population and Sample. The population for the studies dealing with student acceptance of the STD and with career-related knowledge and attitudes of students was composed of all junior high school students at the participating sites. The sample for these studies was composed of those junior high school students who participated in the STD classes and who completed the necessary data questionnaires. The decision regarding which students would participate in the STD classes — and therefore the decision regarding the composition of the study sample — was left to the administrative and teaching personnel at each of the respective sites. Consequently, there were no assurances that the selected samples at each site were representative of the larger junior high population. At some schools, the sample consisted mainly of 7th and 8th grade students; at others, the sample consisted mainly of 8th and 9th graders. Moreover, the composition of the student sample changed between semesters and within semesters.

Teacher In-Service Population and Sample. The population for the study dealing with teacher acceptance of in-service programming was composed of all teachers at participating schools. The sample for this study consisted of those teachers who actually attended in-service programs and who completed data questionnaires. The decision regarding which teachers would participate in the in-service programs varied from school to school and from program to program. In some schools, attendance was mandatory for all teachers. In others, attendance was voluntary, with some teachers attending out of general interest and some attending to earn college or recertification credit.

The School Staff Population and Sample. The population for the study dealing with acceptance of the STD, its services, and its products by school staff was composed of all administrators, teachers, and counselors at participating schools. The sample for this study consisted of those persons who voluntarily completed data questionnaires at each of the three data collection points (September, 1974; January, 1975; and May, 1975). The composition of the sample varied slightly over the course of the school year.

General Audience (Community) Population and Sample. The population for the study dealing with community acceptance of evening ("Footprints") broadcasts was composed of all residents of the communities in which participating schools were located. The sample for this study consisted of those persons who actually attended evening programs and who completed data questionnaires after each program. The decision regarding who would attend — and consequently the decision regarding the composition of the sample — was a function of: (1) individual awareness of the programs; (2) individual interest in the programs; and (3) individual ability to attend.

The Public Television Audience Population and Sample. The population of the study dealing with acceptance of STD programming by public television viewers consisted of the residents of three selected communities: Pueblo, Colorado; Santa Fe, New Mexico; and Boulder City, Nevada. According to the 1970 census, these communities had a total of 143,908 residents. The sample for this study consisted of 1,089 respondents randomly selected.

Community and State Leaders Population and Sample. The population of the study dealing with acceptance of the STD by community and state leaders consisted of governors, governors' assistants, upper-eschelon personnel of state educational agencies, and community persons considered to be influential in community affairs in each of the participating sites. Community leaders were selected through a "reputational" method and placed on an STD mailing list. In this case, the sample coincided with the study population.

SUMMARY REPORT ON ACCEPTANCE OF THE STD BY PARTICIPATING STUDENTS

The purpose of this section is to present a general, non-technical summary of the junior high school students' acceptance of their STD class, as well as a summary of their acceptance of specific related products and services. Where appropriate, efforts have been made to interpret or draw initial implications from the findings.

The discussion has been organized around three questions which this study addressed:

1. What were the expressed opinions of students regarding the STD class and related products and services?
2. Were there differences in expressed opinions between or among students with different characteristics (e.g., type of site, grade, and Locus of Control)?
3. What was the relationship between levels of student acceptance and teacher acceptance?

To answer these questions, student opinions were solicited regarding the STD career education class, the three major student program series, the student magazine, and the audio interactive (two-way communications) system. The first semester was designed to provide formative data for the refinement of programs; therefore, the analyses presented here were based primarily on the results of second semester student responses to these questions.

QUESTION 1: What Were the Expressed Opinions of Students Regarding the STD Class and Related Products and Services?

THE STD CLASS

Students were asked to rate the STD class as a whole.

Indicator. The indicator of student acceptance of the STD class was their response to the question, "Would you like to see the STD class continued for future junior high students?"

Findings. The findings have been presented in graphic form in Figure 12. Sixty percent of all students indicated without reservation that they would like these classes to continue. While 25 percent of the students indicated some uncertainty and less than 15 percent responded negatively, overall, more than four-fifths of all students indicated some interest in having the series continued.

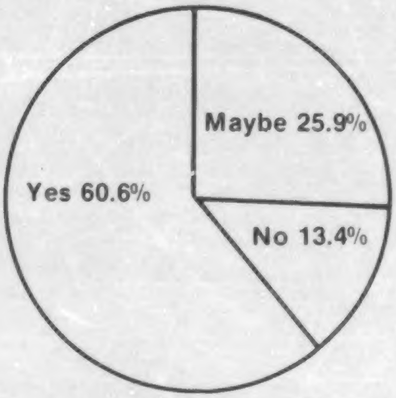


FIGURE 12
Distribution of Student Acceptance of the STD Class

RELATED PRODUCTS

Students were asked to rate: (1) the "Time Out" program series; (2) the "Time In" program series; (3) the "Time for You" program series; and (4) the student magazine.

Indicator. Students were asked to rate the three program series and the student magazine in terms of their information, helpfulness, and interest.

Findings. Referring to Figure 13, with only two exceptions, students consistently rated the four products in the following ranking order: (1) the pre-taped "Time Out" program series; (2) the interactive "Time In" program series; (3) the interactive "Time for You" program series; and (4) the student magazine. In one exception, "Time for You" was rated slightly above "Time In" in terms of interest; in the other, the student magazine was rated considerably above both the "Time In" and "Time for You" program series in terms of interest. In looking at the two highest possible categories for each of the four content products, the "Time Out" program series was rated highest on all three indicators: information, helpfulness, and interest.

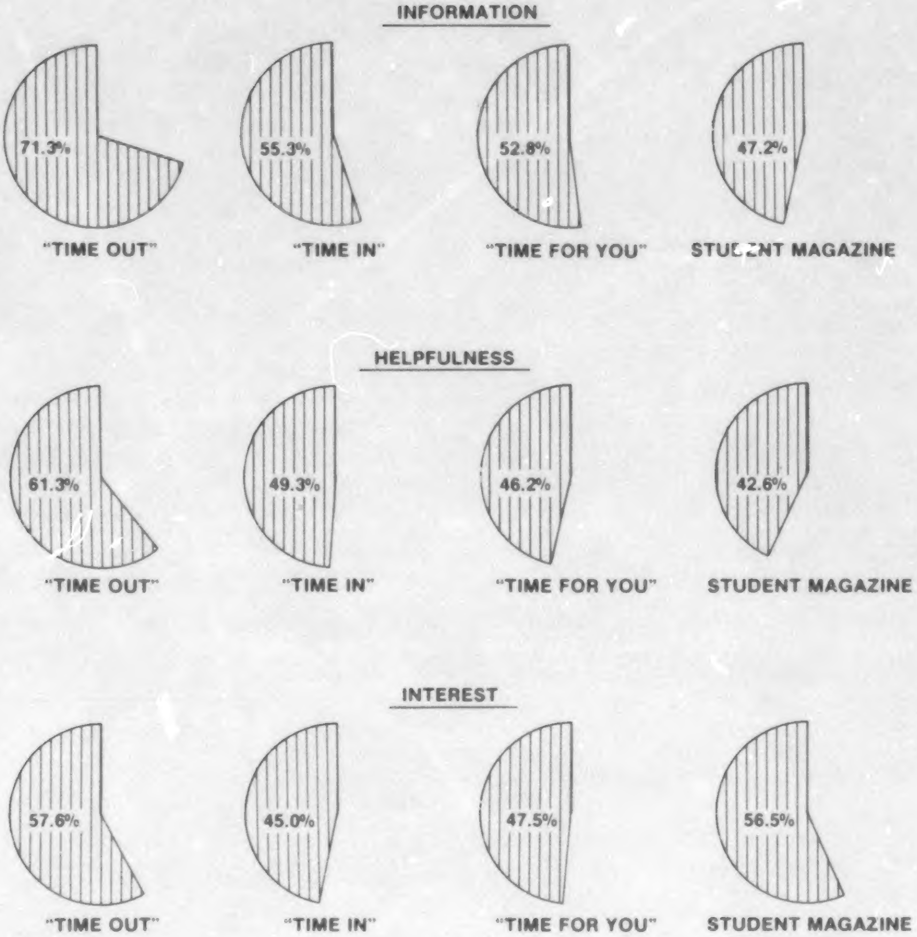


FIGURE 13
STUDENT ACCEPTANCE OF STD
PRODUCTS AS MEASURED BY THREE CRITERIA

Discussion. The following interpretations were based on staff observations and student comments made both in letters and over the audio interactive system.

The high ratings attributed to the pre-taped "Time Out" series appeared to be due to at least three factors:

1. This series, unlike other products, was presented as a drama specifically designed for junior high school students.
2. The students found it easy to identify with the characters in this series.
3. This series incorporated intriguing special audio and visual effects not found in the other STD programs.

In considering the relative ratings of the three program series, the reader should recognize that the pre-taped "Time Out" series was directed at all types of sites; whereas, the two interactive programs were geared specifically for direct participation by students at Intensive Sites. However, the results of the acceptance of these two programs are composite ratings of students at both interactive and non-interactive sites.

A comparison of the two interactive programs with each other revealed that "Time In" was rated higher than "Time for You" both in terms of information and helpfulness. This difference may have been due to at least four factors:

1. The students may have preferred the shorter (6-minute) format of "Time In" to the more lengthy (30-minute) format of "Time for You."
2. The fact that "Time In" immediately followed and was related to the "Time Out" series meant that students were provided with specific background material which could focus discussion.
3. The pace of interaction was faster in the "Time In" series than in the "Time for You" series. "Time In" was conducted by STD staff members who gave short, concise, and to-the-point answers; whereas, the non-staff guest speakers who conducted "Time for You" often responded with longer, more general answers.
4. "Time for You" incorporated live interaction between the sites and the Denver studios, but its use of discussion panels and visiting professionals seemed to be a less acceptable format than that used in the other services.

Interest was the one attribute for which "Time for You" was rated higher than "Time In." This difference may have been partially attributable to the fact that the last five "Time for You" programs of the second semester were written and produced by the sites.

Regarding the acceptance of the student magazine, interviews with students indicated that they rated it high in interest in comparison with conventional student workbooks.

THE INTERACTIVE SYSTEM

In addition to the four products discussed above, students were asked to rate the audio interaction (two-way communication) system.

Indicator. Students were asked to indicate how much the interaction system contributed to their understanding of the career-related information presented in the "Time Out" series.

Findings. Almost half (48 percent) of the students felt that the interactive capability enhanced their learning.

Discussion. As discussed in the "Student Learning Gains" section, those students at interactive sites demonstrated larger gains in knowledge than did other students.

QUESTION 2: Were There Differences in Expressed Opinions Between or Among Students with Different Characteristics at Different Types of Sites?

Many variations in opinions occurred among different categories of students. Only significant differences for those groups of students at the extremes of the acceptance scale (i.e., those groups demonstrating the highest and the lowest levels of acceptance) have been summarized in this section.

Indicator. Students were asked to assess the STD class in terms of four standards: (1) its quality in comparison to a regular classroom lesson; (2) its information; (3) its helpfulness; and (4) its interest.

Findings. The findings have been presented in Table 21.

Students demonstrating the highest level of acceptance were: (1) at Intensive Sites; (2) 13 years of age; (3) 8th graders; and (4) either Mexican Americans or Native Americans.

Students demonstrating the lowest levels of acceptance were: (1) at Open Sites; (2) 15 years of age; (3) 10th graders or above; and (4) Anglos.

For sex and grade-equivalent achievement levels, significant differences were found on only one out of four items.

Discussion. The profiles presented above indicate that:

1. The interactive capability increased student acceptance of the STD career education class as a whole.
2. The STD was successful in developing programs for a specific

audience, as demonstrated by the high acceptance levels of the target groups.

3. The high acceptance levels demonstrated by the Mexican Americans and the Native Americans suggest that the use of ethnic personalities in non-stereotyped roles may increase the acceptance by minority groups.
4. Although the STD students were predominantly 7th, 8th, and 9th graders, their grade-equivalent achievement levels ranged from the 4th through the 10th grades. Both low and high achievers perceived the STD class to be informative, helpful, and interesting.

TABLE 21

A Comparison of Student Groupings In Relation to Their Acceptance of the STD Class

	Criteria used to assess acceptance of the STD class							
	Comparison with Regular Classroom Lesson		Information		Helpfulness		Interest	
Student Groupings	Highest Level of Acceptance	Lowest Level of Acceptance	Highest Level of Acceptance	Lowest Level of Acceptance	Highest Level of Acceptance	Lowest Level of Acceptance	Highest Level of Acceptance	Lowest Level of Acceptance
Type of Site	Intensive	Open	Intensive	Open	Intensive	Open	Intensive	Open
Age	13 & 14	15	13	15	13	15	13	15
Sex	N.S.	N.S.	N.S.	N.S.	Females	Males	N.S.	N.S.
Grade	8th	10th & above	7th & 8th	10th & above	8th	10th & above	8th	10th & above
Ethnicity	Mexican American	Anglo	Native American	Anglo	Mexican American	Anglo	Native American	Anglo
Grade-Equivalent Achievement Level	4th & Below	7th	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

NOTE: N.S. = Not Statistically Significant

QUESTION 3: What Was the Relationship Between Student Acceptance and Teacher Acceptance?

Indicator. The indicator was the relationship between student acceptance and teacher acceptance as measured by the Pearson Product-Moment correlation coefficient.

Finding. A fairly high relationship was found between teacher acceptance and student acceptance ($r = 0.63$). Students whose teachers demonstrated high levels of acceptance reacted more positively to the STD career education class than did students whose teachers demonstrated low levels of acceptance .

Discussion. The above results should be viewed in light of the fact that it is not possible to determine whether high student acceptance causes high teacher acceptance or vice versa. In fact, the acceptance levels of students and teachers were probably interdependent.

SUMMARY REPORT ON ACCEPTANCE OF TEACHER IN-SERVICE ("CAREERS AND THE CLASSROOM: A NEW PERSPECTIVE FOR TEACHERS") BY PARTICIPATING PERSONNEL

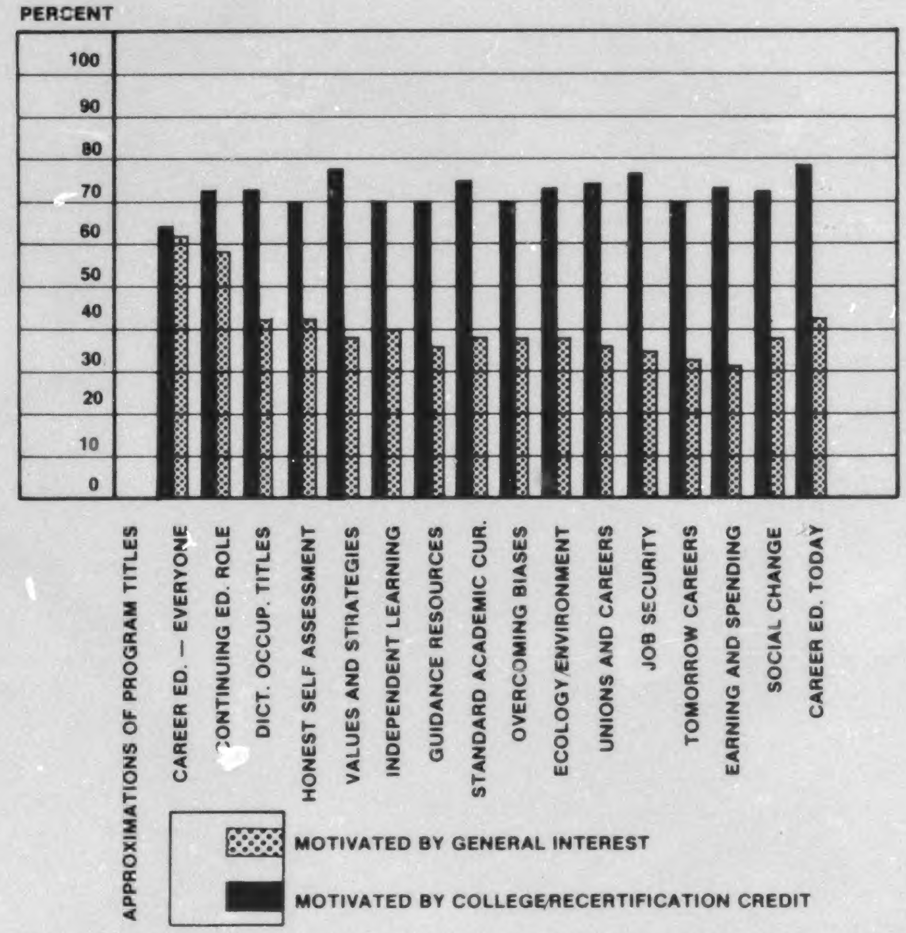
The purpose of this section is to present a general, non-technical summary of the acceptance of the 16 programs comprising the teacher in-service training series, "Careers and the Classroom: A New Perspective for Teachers." Results were derived from analysis of final reports submitted at the end of the series. The questions addressed in this analysis were:

1. What was the general acceptance of "Careers and the Classroom" by those participating?
2. What differences in acceptance were apparent among programs?

QUESTION 1: **What Was the General Acceptance of "Careers and the Classroom" by Those Participating?**

Indicators. General acceptance of the series was assessed by three indicators: (1) teacher attendance patterns; (2) teacher ratings of each program; and (3) teacher evaluation of various program elements for the series as a whole.

Findings. Teachers attending each program were asked to indicate their motivation for attending; i.e., whether they were attending: (1) out of general interest; (2) to earn college credit; and/or (3) because it was expected or required of them. The attendance patterns for the first two categories have been presented in Figure 14. Attendance by those whose motivation was to earn college credit was relatively stable throughout the series; whereas, the attendance of those motivated by general interest decreased after the first two programs. Whether teachers attended out of general interest, to earn college credit, or because it was required of them, attendance patterns remained fairly stable. The main reason for high teacher attendance was for college recertification credit: 554 educators received credit and 322 teachers received recertification from their state department of education.



CATEGORIES WERE NOT MUTUALLY EXCLUSIVE — I.E., SOME PEOPLE INDICATED THEY WERE ATTENDING FOR BOTH REASONS

FIGURE 14

REASON GIVEN FOR PARTICIPATION ACROSS PROGRAMS IN "CAREERS" SERIES

General acceptance of the in-service series was also measured by teacher ratings of individual programs. At the close of each broadcast, teachers were asked to rate three attributes of the program: (1) interest; (2) classroom utility; and (3) the extent to which the program was likely to stimulate further action within the school on the topic(s) presented. The findings have been presented in Figure 15. Overall, teachers rated the series highest in terms of interest, second in terms of classroom utility, and third in terms of action stimulation. Of the 16 programs in the series, 14 (87.5 percent) were rated as "fairly high" or above in terms of interest; 10 (62.5 percent) were rated "fairly high" or above in terms of classroom utility; and 2 (12.5 percent) were rated "fairly high" or above in terms of action stimulation. Teachers who attended these programs on a voluntary basis (i.e., out of general interest or to earn college credit) consistently rated the programs higher on all three scales than did teachers who attended because it was expected or required of them.

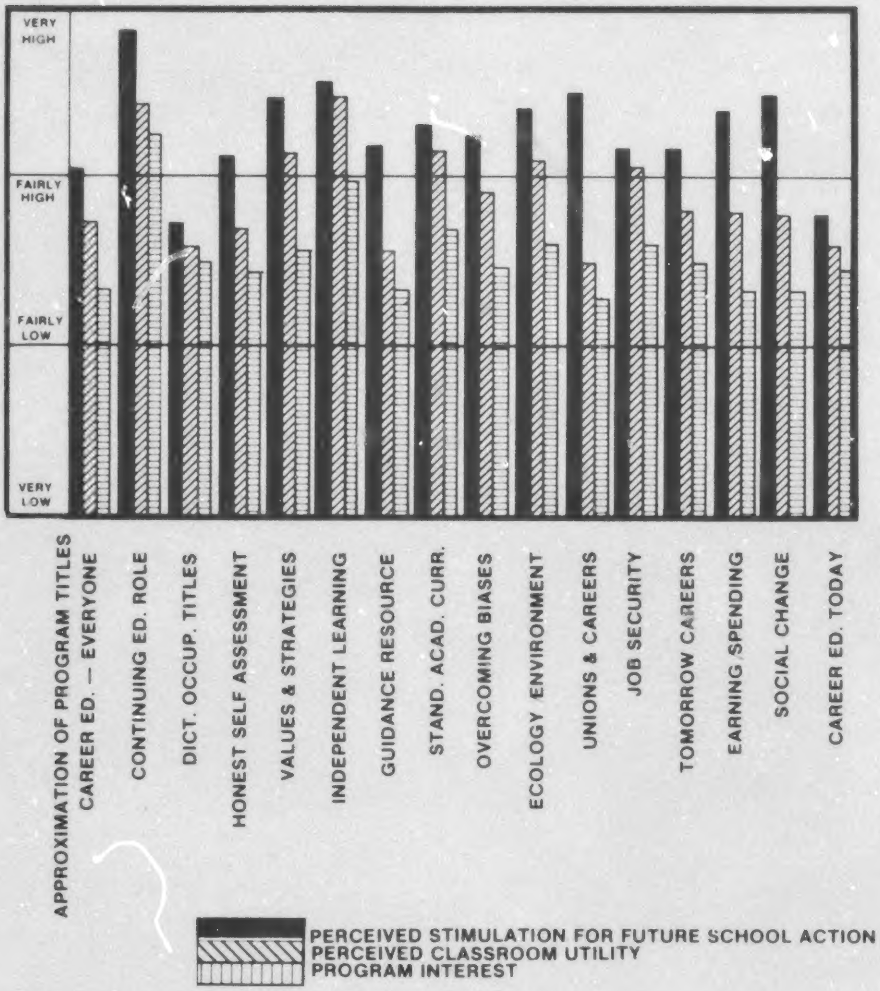


FIGURE 15

AUDIENCE ACCEPTANCE OF THE CAREERS AND THE CLASSROOM SERIES DEPICTED ACROSS PROGRAMS

The final measure of general acceptance of "Careers and the Classroom: A New Perspective for Teachers" was teacher ratings of four elements within each program: (1) the moderator; (2) the presenter or content specialist; (3) the format of the program; and (4) the audio interaction between the Denver studio and teachers at the respective sites. A four-point scale was used. The findings have been presented in Figure 16. Overall, teachers gave positive ratings (above 2.5) to all four program elements. Of the four elements, presenters received the highest rating (3.22), followed by format (2.99), moderators (2.89), and interaction (2.59).

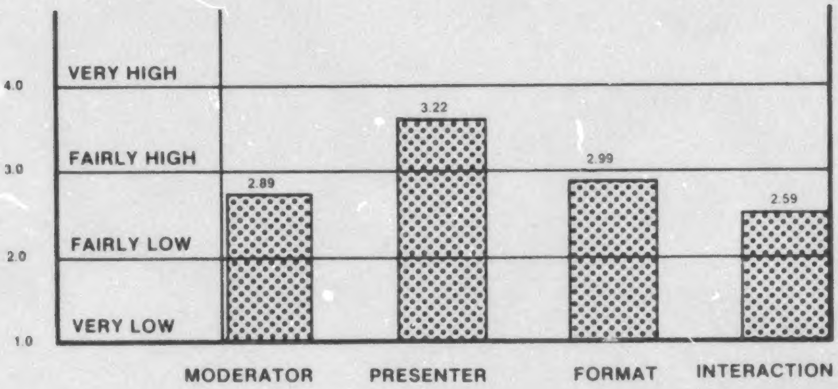


FIGURE 16

AUDIENCE ACCEPTANCE AS A FUNCTION OF PROGRAM ELEMENTS

Discussion. The reactions of viewers (from data not presented here) indicated that:

1. The lecture format, a necessity because of limited resources, may not have been consistent with the audience expectations of a workshop and/or demonstration format.
2. Extending the course over the entire school year was at variance with conventional college credit courses.
3. Negative reactions can be expected from mandatory activities. (Administrators might use this finding as a planning guide for future in-service activities.)

QUESTION 2: **What Differences in Acceptance Were Apparent Between Programs?**

Indicator. In the final evaluation questionnaires, teachers were asked to rank: (1) the three **best** programs; (2) the three **worst** programs; and (3) the three **most helpful** programs.

Findings. The programs rated best were:

"Continuing Education's Role"
"Ecology/Environment — How Do They Impact Upon Careers"
"Honest Self-Assessment"

The programs rated worst were:

"Dictionary of Occupational Titles"
"Unions and Career Education"
"Career Guidance Resources"

The programs rated most helpful were:

"Honest Self-Assessment"

"Values and Strategies in Decision-Making"

"Earning a Living is Not Enough — The Art of intelligent Spending"

Results have been presented in Table 22.

TABLE 22
Rank Order of "Careers and the Classroom: A New Perspective for Teachers" Programs

Show	Frequency of Mention as			Rank Order As		
	Best	Worst	Helpful	Best	Worst	Helpful
Career Education is for Everyone	55	57	37	12T	7	15
Continuing Education's Role	198	51	94	1	3	5T
Dictionary of Occupational Titles	51	254	93	15	16	7
Honest Self-Assessment	143	75	125	3	11	1
Values and Strategies in Decision-Making	117	53	119	6	4	2
Independent Learning	65	61	79	11	9	10
Career Guidance Resources	67	99	94	10	14	5T
Standard Academic Curriculum	55	54	67	12T	5	12
Overcoming Biases in Counseling Students	53	90	56	14	12	13T
Ecology/Environment — How Do They Impact Upon Careers	145	66	88	2	10	8
Unions and Career Education	118	131	68	4T	15	11
Job Security	100	56	99	8	6	4
Self-Employment (Not Shown)	39	50	35	16	2	16
Earning and Spending	118	48	116	4T	1	3
Effects of Social Change	110	60	80	7	8	9
Tomorrow's Careers	79	94	56	9	13	13T

550 Total Respondents

Note: "T" designates a tie in rank order between two programs. For example, "Unions and Career Education" and "Earning and Spending" were each selected by 118 respondents as the best program, which was the fourth highest number for any program. Therefore, both programs were ranked fourth, and no program was ranked fifth. This accounts for missing rankings.

Discussion. It is evident that the highest rated programs were those that offered solutions to contemporary school problems.

SUMMARY REPORT ON THE ACCEPTANCE OF THE STD BY SCHOOL STAFF AT PARTICIPATING SITES

This section presents a general, non-technical summary of school staffs' acceptance of the STD and its products and services. Results were derived from analyses of questionnaires completed by staffs of participating schools at the beginning, middle, and end of the Project, relative to three questions:

1. What was the general acceptance by school staffs of the STD, its products, and services?
2. What relationship existed between acceptance and staff position?
3. What changes occurred over the course of the Project in school staff acceptance of the STD, its products, and services?

QUESTION 1: **What Was the General Acceptance by School Staffs of the STD, Its Products, and Services?**

Indicator. The indicator of general acceptance was the mean of all responses on seven semantic scales (each having five points) rating the STD. The same scales also were used to rate each of the major products and services of the STD. Although the relative **order** of acceptance of products is discernible, the semantic scales were relatively insensitive to the **magnitude** of acceptance. Therefore, relative ratings rather than actual ratings have been presented.

Findings. Results from the three sets of questionnaires indicated that the response of school staffs to the STD was positive (80 percent) and their response to all STD products and services was positive. The video products were rated in the following order of acceptance:

(1) Materials Distribution Service (highest);
(2) student programs;
(3) in-service programs ("Careers and the Classroom: A New Perspective for Teachers"); and
(4) community programs ("Footprints").

The printed products were rated as follows:

(1) teacher guides (highest);
(2) the student magazine; and
(3) the follow-up materials (designed for the "Footprints" series).

Although the Materials Distribution Service catalog was not rated, many positive comments were made about it. The major STD services were rated in the following order:

(1) Field Services (highest);
(2) Public Information; and
(3) Research.

Discussion. The preceding findings (augmented by additional information gained from "Case Study" observations, comments written on **Weekly Site Report** forms, and field staff oral comments) suggest the following interpretations:

1. The high ratings accurately reflect the quality of the STD, its products, and its services; **or**
2. Novel content and packaging may have positively influenced acceptance levels; **or**
3. Due to site involvement in the STD and the use of new technology, the potential Hawthorne effect may have been operating; **or**
4. The high ratings may have been due to some combination of the above three factors.

QUESTION 2: **What Relationship Existed Between Acceptance and Staff Position?**

Indicator. The indicator was the correlation of school staff position and level of acceptance.

Findings. Administrators gave a higher rating to the STD, its products, and services than did teachers. Teachers directly involved in career education classes using STD programs rated all products and services higher than did other teachers. Counselors gave a higher rating to student programming than did teachers in general. High school teachers gave higher ratings to the four series than did other teachers. Years of experience in education or instructional area produced no differences in ratings. Ratings by all personnel were generally high and positive.

Discussion. The teachers and administrators who were more directly involved in STD-related activities were more accepting of the STD, its products, and its services than were other personnel.

QUESTION 3: **What Changes Occurred Over the Course of the Project in School Staff Acceptance of the STD, Its Products, and Services?**

Indicator. The indicator was the mean value of semantic scales over three measurement periods:

(1) in September, 1974, preceding operations;

(2) in January, 1975, at the close of the first semester; and

(3) in May, 1975, at the end of the second semester.

Findings. School staff ratings on overall acceptance of the STD as well as ratings on acceptance of all STD products and services were positive at every measurement point. The acceptance trend for the STD-in-general was an initially high rating, followed by a moderate decline at midyear, and a slight increase at the end. The rating for Materials Distribution Service declined slightly at midyear and rose significantly at the final measurement. At the final measurement, MDS was given the highest possible rating by virtually every respondent. The midyear measurement for Field Services was slightly higher than the beginning measurement, but there was a decline in the final rating of this service. The ratings for interaction and in-service were initially high, declined significantly at midyear, and increased slightly at the final measurement. The ratings for "Footprints," Research, the teacher guide, the student magazine, and "Time Out" were initially high, declined at midyear, and continued to decline at the end measurement.

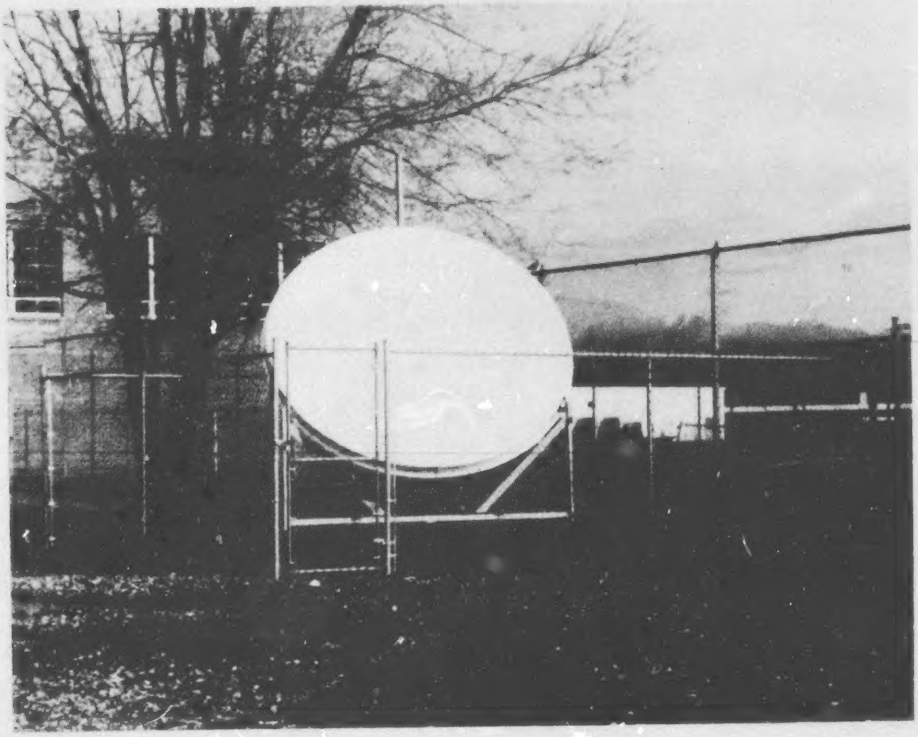


Figure 17 graphically illustrates that all ratings for all STD products and services maintained an acceptability level above midpoint.

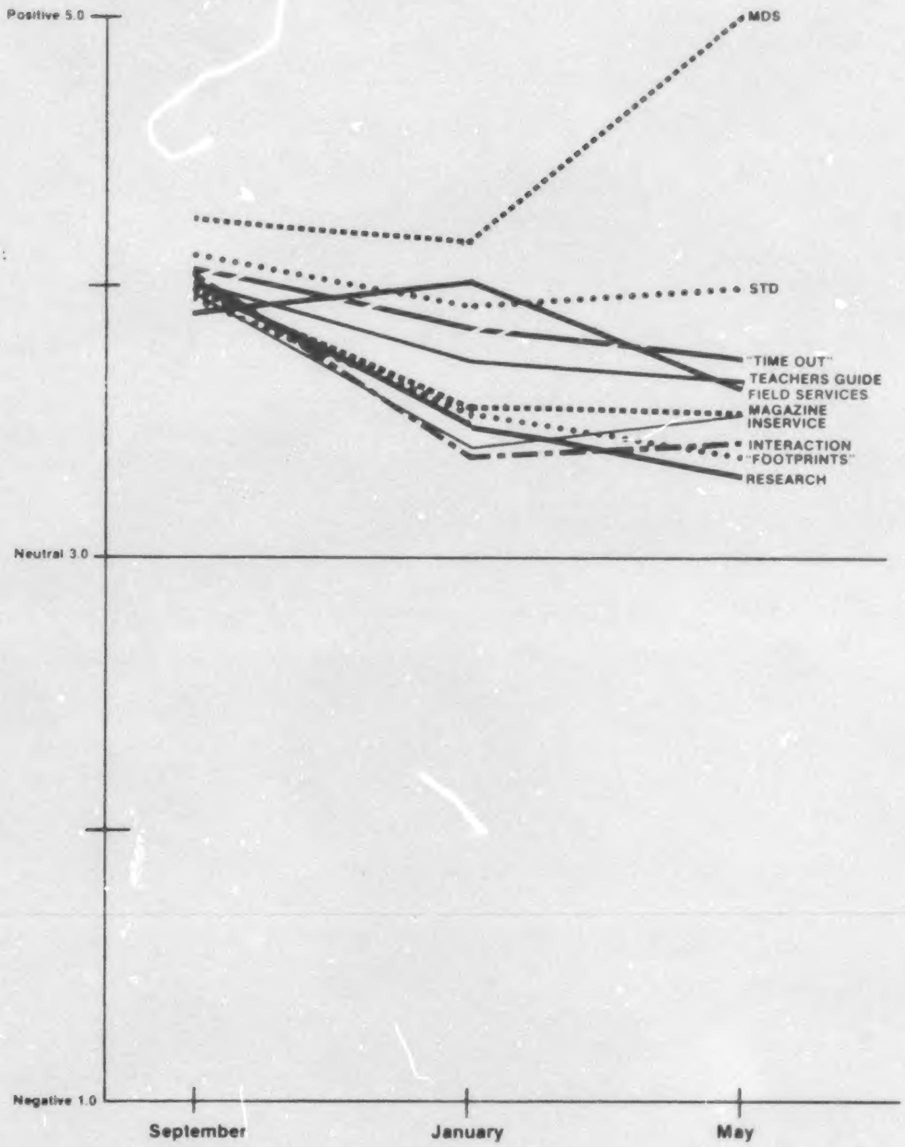


FIGURE 17

OVERALL ACCEPTANCE BY AUDIENCES OF ALL STD PRODUCTS AND SERVICES

Discussion. In interpreting the preceding results, the reader should keep in mind that all ratings were positive and should recognize that the slight decline at midyear was anticipated (from experience with previous studies) and may have been due to initial high user expectations and initial operational problems.

OTHER FINDINGS: SCHOOL STAFF POPULATION

Indicator. The indicator was the school staff questionnaire for September, 1974.

Findings. There were significant differences between groups which had been oriented to the STD and those which had not. Those teachers and school people who had attended an STD meeting (whether it was an orientation, in-depth training session, or an informal get-together) rated all STD products and services more positively than did those who did not attend. There were no differences between groups categorized by sex or between high school department chairmen and board members. Frequency of social contacts, years experience in elementary, junior high, or high school also produced no significant differences. Ratings by those who indicated satisfaction with the STD were significantly more positive for all STD products and services than were ratings by those who indicated dissatisfaction. Only one difference was significant among ethnic groups: Native Americans rated interaction more positively than did other groups.

SUMMARY REPORT ON ACCEPTANCE OF THE COMMUNITY-DIRECTED PROGRAMS ("FOOTPRINTS") BY AUDIENCE MEMBERS

The purpose of this section is to present a general, non-technical summary of community members' acceptance of the evening program series, "Footprints," and specific related products and services. Where appropriate, efforts are made to interpret and draw implications from the findings.

The section has been organized around three questions:

1. To what degree did the STD attract community audience members?
2. To what degree did the STD hold audience members across programs?
3. What were the expressed opinions of audience members regarding the "Footprints" series and selected products and services?

QUESTION 1: To What Degree Did the STD Attract Community Audience Members?

Indicator. Audience attendance was the indicator of the STD's ability to attract viewers. Audience attendance was reported by the site coordinator in the **Weekly Site Report**.

Findings. Counting repeat viewers, the total reported viewing audience was 2,932 members. Distribution of this total audience across programs has been shown in Figure 18.

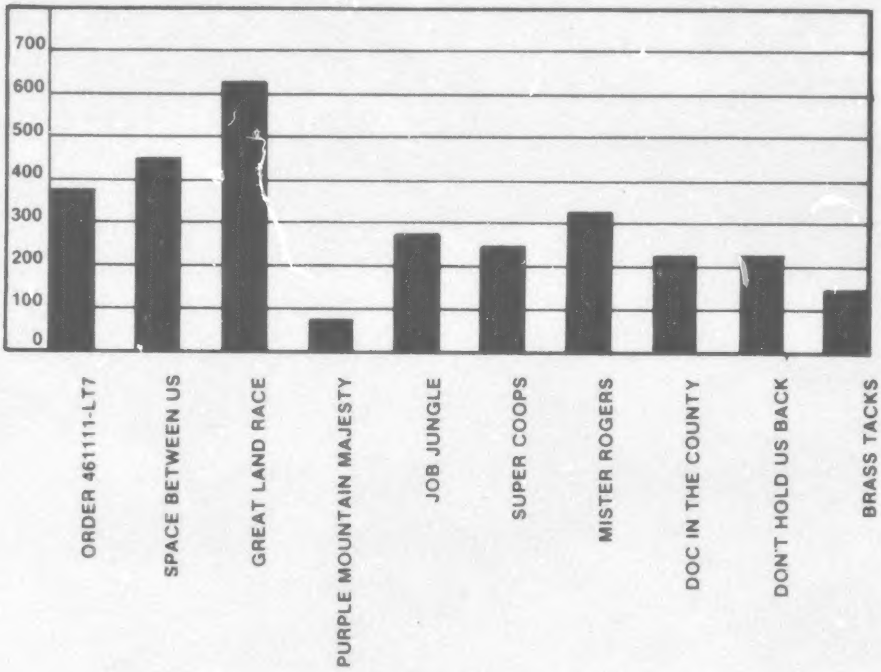


FIGURE 18

THE NUMBER OF VIEWERS ATTENDING EACH "FOOTPRINTS" BROADCAST AT INTENSIVE AND RECEIVE-ONLY SITES

Discussion. Detailed studies were not conducted beforehand; therefore the potential audience for these evening programs was not known and it is not possible to say whether the number of persons who viewed the programs relative to the number of potential viewers was high or low. However, the attendance figures for some programs in this series could be used as baseline data for future series. From on-site observations and comments made by community members, attendance patterns may be attributable to a variety of factors, including: the program schedule; weather; the initial novelty of satellite technology; public information efforts; the special interest of particular topics; holidays; the inconvenience of attending programs; and the relative attraction of competing alternatives.

QUESTION 2: **To What Degree Did the STD Hold Audience Members Across Programs?**

Indicator. The indicator of the holding power of the STD's "Footprints" series was the trend in the percentages of repeat viewers across programs.

Findings. There was an increasing trend in repeat viewings. (See Figure 19.) Overall, 65.6 percent of the viewers who saw one evening program returned to see at least one additional program. All of the viewers at the last program had seen at least one previous program, and 63 percent reported seeing at least three.

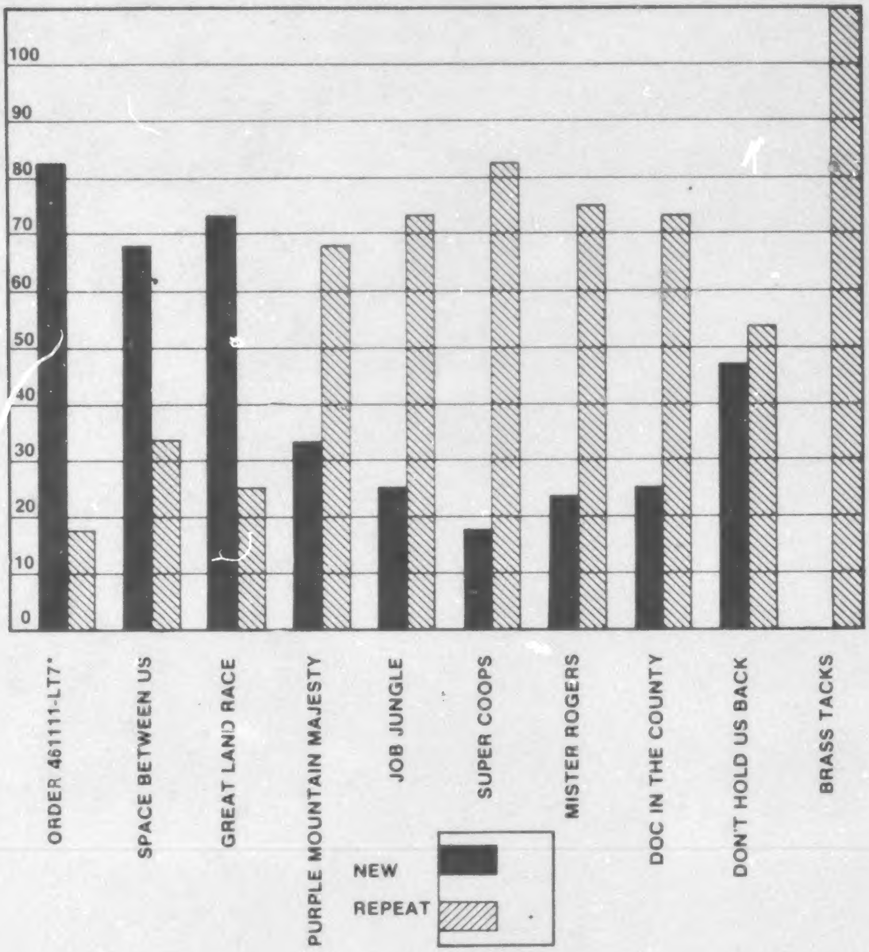


FIGURE 19

THE PERCENTAGE OF NEW VIEWERS VS. REPEAT VIEWERS FOR EACH STD EVENING PROGRAM

*Many viewers were previously exposed to taped versions of the "We Are Here" program.

Discussion. The decline in new viewers is understandable in light of two interrelated factors: (1) only 50 percent of the viewers rated the programs as being pleasurable; and (2) "word of mouth" was the primary communication vehicle by which people learned of the series.

QUESTION 3: What Were the Expressed Opinions of Audience Members Regarding the "Footprints" Series and Other Selected Products and Services?

THE "FOOTPRINTS" SERIES

Indicator. The indicator of audience acceptance of the "Footprints" series was the response to the question, "Do you think the evening programs for your community should be continued next year?"

Findings. Eighty percent of the viewers indicated, without reservation, that they would like to see the evening programs continued; less than three percent responded negatively.

OTHER SELECTED PRODUCTS AND SERVICES

Indicators. Audience members were asked to rate both the "Footprints" program and the accompanying interaction according to whether they perceived these products as: (a) a pleasure; (b) helpful; (c) of very little worth; and/or (d) a complete waste of time. They also were asked to rate the activities of the site coordinator only in terms of helpfulness.

Findings. Findings have been presented in Table 23. Both products were rated relatively high in helpfulness and only moderately high in pleasurability. The pre-taped segments of the "Footprints" programs were rated as being superior to the interaction segments both in terms of pleasure and helpfulness.

TABLE 23

Percentage of Audience Who Considered the Product to Be:

	(a) A Pleasure	(b) Helpful	(c) Of Very Little Worth	(d) A Waste Of Time
Footprints	49.9	71.4	4.7	0.9
Interaction	43.3	59.7	7.2	0.8

In their assessment of the value of the presence of the site coordinator at the evening programs, 84.1 percent of the audience responded "helpful" or "very helpful" and only 1.5 percent responded "not helpful."

Audience opinions about these products and services have been further differentiated according to type of site in Table 24. Viewers at interactive sites rated both the "Footprints" series and the interactive segments significantly higher in terms of pleasure than did viewers at non-interactive sites. However, viewers at both IT and ROT sites rated both products as equally helpful.

TABLE 24

Percentage of Audience Who Considered the Product to be:

	A Pleasure		Helpful	
	Interactive	Non-Interactive	Interactive	Non-Interactive
Footprints	53.7	48.1	73.6	73.6
Interaction	53.0	44.0	67.4	66.2

There was slight difference in audience assessment of the presence of the site coordinator: 95.0 percent of the viewers at Intensive Sites and 90.3 percent of the viewers at Receive-Only Sites responded that the presence of the site coordinator was "helpful" or "very helpful."

SUMMARY REPORT ON ACCEPTANCE OF THE "TIME OUT" AND "FOOTPRINTS" SERIES BY PUBLIC TELEVISION VIEWERS

The purpose of this section is to present a general, non-technical summary of the acceptance by public television viewers of two products of the STD, the "Time Out" and "Footprints" series. The study was based on a sample of the populations of three communities. The cities used for the study had been previously identified during the site selection process as "Open Research Sites," based on the following criteria: (1) varying sizes of population (large, medium, and small); (2) ethnic representativeness of population (compared to the Rocky Mountain region); (3) reception of public television; and (4) willingness to participate.

The discussion has been organized around three questions:

1. To what degree did the STD attract PTV viewers?
2. To what extent did the STD hold PTV viewers across programs?
3. What were the expressed opinions of PTV viewers regarding these series?

Where appropriate, efforts have been made to interpret or draw implications from the findings.

QUESTION 1: **To What Degree Did the STD Attract PTV Viewers?**

Indicator. The indicator of audience attraction was the viewing patterns of the sample, as indicated by responses to a telephone coincidental survey.

Findings. Of the 1,089 people included in the survey sample, 3.3 percent reported having watched at least one program in the "Footprints" series, and 4.1 percent reported having watched at least one program in the "Time Out" series.

QUESTION 2: **To What Extent Did the STD Hold PTV Viewers Across Programs?**

Indicator. Those individuals indicating that they had viewed either the "Footprints" series or the "Time Out" series were asked to indicate how many programs they had watched. "Footprints" viewers were also asked to specify which programs they had watched.

Findings. Of the 81 programs in the "Time Out" series, viewers watched an average of 2.05 programs. Of the 10 programs in the "Footprints" series, viewers watched an average of 6.47 programs. Over 30 percent of the "Footprints" viewers reported having watched 10 programs; over 50 percent reported having watched the last 9 of the 10 programs.

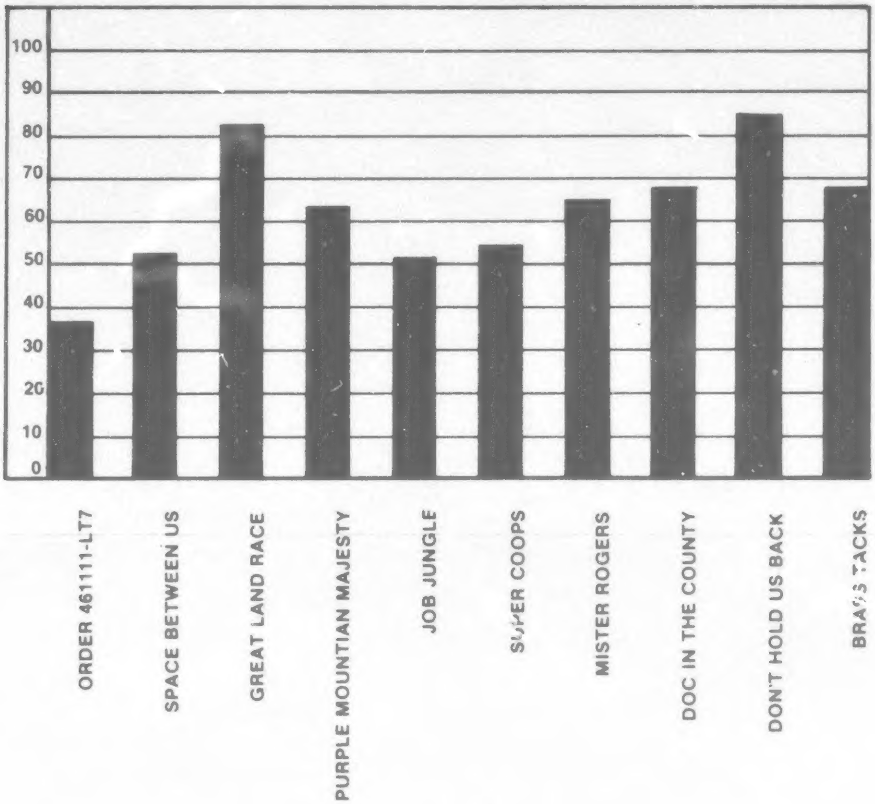


FIGURE 20

THE PERCENTAGE OF VIEWERS WHO WATCHED EACH "FOOTPRINTS" PROGRAM

Discussion. The small number of "Time Out" programs watched by PTV viewers is not surprising. The series was developed for junior high school students and the average age of the PTV sample was 45 years. Moreover, the series was broadcast in mid-morning, which is not prime viewing time.

The relatively larger number of "Footprints" viewers (a significant percentage of whom were repeat viewers) suggests that the topics chosen for this series were of general interest to the PTV audience.

QUESTION 3: **What Were the Expressed Opinions of PTV Viewers Regarding These Series?**

Indicator. The indicator of expressed opinions regarding the "Time Out" series was viewer response to the question, "Do you consider the series to be:

(1) a pleasure to watch;
(2) informative;
(3) of very little worth; or
(4) a complete waste of time?"

Findings. Of the total sample, 42.6 percent of the viewers considered the series to be a "pleasure to watch"; 55.3 percent considered it "informative"; and less than 2.5 percent considered it to be of very little worth or a complete waste of time.

Discussion. Respondents were asked to assess this product using only a single set of non-graduated and non-mutually exclusive categories. Therefore, it is difficult to draw conclusions about audience acceptance of specific attributes of the product. Nevertheless, inasmuch as only 2.5 percent of the respondents found the series to be "of little worth" or "a complete waste of time," it can be said that an overwhelming majority of the public television audience found one or more of the attributes of this product to be satisfactory.

SUMMARY REPORT ON ACCEPTANCE OF STD BY COMMUNITY AND STATE LEADERS

A summary of the findings concerning acceptance of the STD by community and state leaders has been presented in this section. The sample of community leaders was taken from the standard STD mailing list, which included people considered to be influential in community affairs. The sample of state leaders included governors, governors' assistants, and selected personnel of state departments of education. The discussion has been organized around three questions:

1. What was the general level of acceptance by community and state leaders?
2. What was the participation of state and community leaders in the STD?
3. What recommendations were made by community and state leaders for future participation in the STD?

QUESTION 1: **What Was the General Level of Acceptance by Community and State Leaders?**

Indicator. The results have been derived from an analysis of a semantic differential opinionnaire.

Findings. In general, both state and community leaders indicated positive acceptance of the STD, its products, and services. Ratings by state leaders were slightly lower than were those by community leaders. Overall, both groups ranked the STD products similarly: (1) Materials Distribution Service (highest); (2) student programming; (3) teacher in-service programming; and (4) community programs. Although the ranked ordering of products was the same for both groups, the level of acceptance for specific products varied between the groups: State leaders rated teacher in-service programs and Field Services higher than did community leaders; community leaders rated community programs and Public Information higher than did state leaders.

Discussion Between the two groups of leaders, differences in levels of acceptance of the STD and specific products may have been due to a number of factors. Education is a major concern of state leaders, and in more than half of the participating states, career education is a particular educational concern. The higher rating attributed to teacher in-service by state leaders may have resulted from their perception that the series enhanced ongoing state efforts in career education. The higher rating attributed to Field Services by state leaders may have reflected their greater familiarity with Field Service personnel. The higher rating given to the "Footprints" series by community leaders may have been due to their assessment of this product from the perspective of community needs; whereas, state leaders may have assessed these products relative to statewide priorities. Finally, the higher acceptance of Public Information services by local leaders may have been caused by the STD's special efforts to direct these services to the local level and tailor them to the local audience.

QUESTION 2: **What Was the Participation of State and Community Leaders in the STD?**

Indicator. Level of participation was indicated by frequency of attendance at STD-related meetings and broadcasts.

Findings. In all categories, state leaders evidenced a higher level of participation in the STD than did community leaders. They were more likely to have attended STD orientation sessions, other meetings related to the Project, or STD broadcasts. They also reported more frequent contacts with STD field staff members.

Discussion. The higher level of participation by state leaders was expected. They were involved in the STD from its early planning stages and were by the nature of their position more likely to be in contact with people involved in activities related to the Project. State leaders had a significantly higher level of attendance at STD broadcasts, especially the "Footprints" series, than did community leaders. This difference may indicate the state leaders' markedly high interest in and commitment to the STD.

QUESTION 3: **What Recommendations Were Made by Community and State Leaders for Future Participation in the STD?**

Indicator. The indicator was the respondents' ranking of priorities among a number of possible future applications of STD technology.

Findings. State and community leaders gave highest priority to the continuation of the STD's current services to remote areas and also indicated that these services should be coordinated with a local capability for producing video programs. Other possible applications were ranked as follows: (1) instruction to schools in general; (2) medical diagnostic services; and (3) adult instructional services.

SUMMARY OF FINDINGS RELATIVE TO STUDENT LEARNING GAINS

Student performance on the career education concepts incorporated in STD student programming has been summarized in this section. Where appropriate, efforts have been made to interpret or draw implications from the findings.

The discussion has been organized around two questions:

1. What was the average gain or change in students' career-related knowledge and attitudes?
2. Were there any differences in career-related knowledge and attitudes between or among students with different characteristics? (See the section "Evaluation Plan" for design details.)

Indicators. The indicators for both questions were the variations between students' pre- and post-test scores on the following tests:

1. The **"Time Out" Test**: A test designed to measure student achievement of the learning objectives of the programs.

2. The **Attitude Scale** of the **Career Maturity Inventory** (referred to as the **CMI Attitude Scale**) a nationally standarized test published by California Test Bureau/McGraw-Hill, Inc.
3. The following three sections of the **Competence Test** of the **Career Maturity Inventory:**

    Part I: Knowing about jobs (referred to as career awareness)

    Part II: Choosing a job (referred to as self-assessment)

    Part III: What should they do? (referred to as decision-making)

Results were based on second semester test data.

QUESTION 1: **What Was the Average Gain or Change in Students' Career-Related Knowledge and Attitudes?**

Indicator. The average change in knowledge and attitudes was derived by computing the average difference between the percentage of items answered correctly by students before and after STD broadcasts. Only those gains demonstrated by the Intensive and Receive-Only Site students have been presented.

Findings. An average gain of 10.4 percent occurred on the **"Time Out" Test.** On the four parts of the **Career Maturity Inventory,** the following average gains occurred: career awareness: 2.0 percent; self-assessment: 3.0 percent; decision-making: 5.1 percent; and **CMI Attitude Scale**: 5.4 percent. (See Table 25.)

TABLE 25

The Average Percent Gain in Knowledge and Attitude Demonstrated by Combined Students at Intensive and Receive-Only Sites

Tests	Average Percent Gain	N
The "Time Out" Test	10.4	882
Career Awareness	2.0	986
Self-Assessment	3.0	975
Decision-Making	5.1	963
CMI Attitude Scale	5.4	1,183

Discussion. The average learning gain of 10.4 percent on the **"Time Out" Test** indicates positive gains in knowledge and attitudes relative to the STD learning objectives by students at Intensive and Receive-Only Sites. In evaluating student gains on the various parts of the **Career Maturity Inventory** the reader should note that the **CMI** was not specifically designed to measure the learning outcomes of the STD career education class, but to measure the "Domain of Career Education" as defined by its author, John Crites. For example, Part I of the **CMI** test was designed to measure job or career awareness. However, the specific jobs included in the **CMI** are not the same as those which were included in the STD's student programming; this difference may account for the differences in student performance on the "**Time Out**" **Test** and the **CMI**.

A gain in maturity level of the students' career-related attitudes also occurred.

QUESTION 2: **Were There Any Differences in Career-Related Knowledge or Attitudes Between or Among Students With Different Characteristics?**

This question has been discussed in two parts. The first part (Part A) discusses differences among students at different types of sites. The second part (Part B) discusses differences relative to the eight other characteristics specified in the "Evaluation Plan."

PART A. DIFFERENCES BY TYPE OF SITE

Differences in knowledge and attitude gains among students at the following types of sites were examined for statistical significance:

1. **Intensive Sites:** These sites received the student programming directly by satellite and were able to interact with each other and the Denver staff.
2. **Receive-Only Sites:** These sites received the student programming directly by satellite, viewed interactive segments, but were not able to interact.
3. **Open Sites:** These sites received the student programming through their local public television stations but did not view interactive segments.
4. **Comparison Sites:** These sites did not receive any of the STD products or services. Students did complete the pre- and post-tests in order to serve as a comparison group.

For each of the previously described tests, the differences occurring in knowledge and attitude gains of students at the four types of sites were found to be significant.

Findings. On all knowledge and attitude tests, students at IT Sites demonstrated the largest gains; students at Comparison Sites demonstrated the smallest gains. Table 26 presents a distribution of gains by type of site.

TABLE 26

A Distribution by Type of Site of Students Demonstrating Different Gains in Knowledge and Attitudes

Gain Rankings				
Tests	Largest	Next to the Largest	Next to the Smallest	Smallest
The "Time Out" Test	Intensive	Open	Receive-Only	Comparison
Career Awareness	Intensive	Open	Receive-Only	Comparison
Self-Assessment	Intensive	Receive-Only	Open	Comparison
Decision-Making	Intensive	Receive-Only	Open	Comparison
CMI Attitude Scale	Intensive	Receive-Only	Open	Comparison

Discussion. Two conclusions are evident from these findings:

1. Students who received STD programming (IT, ROT, and Open Sites) demonstrated higher learning gains than did students who did not receive these STD products and services (Comparison Sites). This conclusion indicates that STD programming enhanced student knowledge and attitudes about career development.
2. Students who were able to participate directly in interaction (IT Sites) demonstrated higher gains than did students who were not (ROT, Open, and Comparison Sites). This conclusion indicates that participation in interactive programming enhanced student knowledge and attitudes about career development.

PART B. DIFFERENCES BY OTHER CHARACTERISTICS

Only those differences which were significant have been presented. The discussion has been organized in terms of: (1) gains demonstrated on the **"Time Out" Test;** (2) performance on the various parts of the **Competence Test** of the **Career Maturity Inventory** ("Domain of Career Education"); and (3) performance on the **CMI Attitude Scale.**

Findings have been reported for the two polar groups for each test, i.e., for those groups demonstrating the largest and the smallest gains in knowledge and attitudes. Each of these polar groups has been described in terms of: (a) age; (b) sex; (c) grade; (d) ethnic background; (e) grade equivalent achievement levels; (f) Locus of Control (inner- or outer-directedness); (g) teacher's level of acceptance of the STD; and (h) student's level of acceptance of the STD.

For Locus of Control, students were divided into quartiles, with the first quartile containing those students most directed by external factors, and the fourth quartile containing those most directed by internal factors. Quartiles were also used for teacher and student acceptance, with the first quartiles containing those individuals demonstrating the lowest acceptance levels and fourth quartiles containing those demonstrating the highest acceptance levels. (These findings have been presented in Table 27.)

(1) Gains Demonstrated on the "Time Out" Test.

Findings. As can be seen in Table 27, students demonstrating the largest gains on the "**Time Out" Test:** (a) were 14 years of age; (b) were 9th graders; (c) were Mexican Americans; (d) were at the next-to-the-highest levels in Locus of Control; and (e) demonstrated the highest levels of acceptance. Moreover, the teachers of these students demonstrated the highest level of acceptance.

Those students demonstrating the smallest gains on the "**Time Out" Test:** (a) were 15 years of age; (b) were 10th graders or above; (c) were Native Americans; (d) were at the lowest level in Locus of Control; and (e) demonstrated the next-to-the-lowest level of acceptance. The teachers of these students demonstrated the next-to-the-lowest level of acceptance.

No significant differences were found between males and females or among students achieving at different grade-equivalent levels.

Discussion. These findings suggest:

1. **Age.** Age was a factor related to student gains on the STD learning objectives. Those students demonstrating the smallest gains were not members of the intended audience (i.e., the 12, 13, and 14 year old students). The highest average gain occurred for the 14 year old students. Differences in average gains among 12, 13, and 14 year old students were slight. Differences between the average gains of the junior high age audience (12-14 year olds) and the 15 year old students were much larger. These findings indicate that the STD student programming proved to be most relevant for its **intended** audience.
2. **Ethnicity.** Ethnicity was found to be related to achievement of the STD learning objectives. The largest gains were made by Mexican American students. The difference between the learning gains of Anglo students and Native American students was slight. The results are somewhat commensurate with the student acceptance data reported in the section, "Summary Report on Acceptance of the STD by Participating Students." It was reported in that section that the largest degree of helpfulness was attributed to the programs by the Mexican American students. According to M.G. Hernandez (**Review of Education Research**, XLIII, no. 1, 1973), Mexican American students have demonstrated a consistent lack of academic achievement. However, the STD-participating Mexican American students' acceptance levels and their achievement of the STD learning objectives suggest that the STD student programming is relevant for students with a Mexican American background. The reasons for this relevancy could lie within several areas: (1) the differences between the television medium and the traditional textbook-oriented class; (2) the use of several Mexican American characterizations within the "Time Out" series; and (3) the elimination within the series of minority stereotyping, especially within the areas of specific careers.

3. **Teacher Acceptance.** Overall, there is no clear relationship between level of teacher acceptance and level of student gains. While those students with teachers demonstrating the highest levels of acceptance gained the most, those students with teachers demonstrating the lowest levels of acceptance had the next-to-the-largest gains. There is no data available to explain these outcomes.
4. **Grade Level.** Those students demonstrating the largest gains were in the 9th grade and those students demonstrating the smallest gains were in the 10th grade or above. However, differences among the learning gains of 7th, 8th, and 9th graders were approximately one point, while the difference between this group and students in the 10th grade or above was approximately 9 points. These findings indicate that the STD student programming was relevant for its intended audience (i.e., the 7th, 8th, and 9th grade students).
5. **Locus of Control.** Students who were most motivated by their external environment (first quartile) achieved the smallest gains on the STD learning objectives. The largest gains were achieved by those students in the next-to-the-highest level of Locus of Control (third quartile). No definite pattern is discernible between these variables.
6. **Level of Student Acceptance.** The largest average gains in learning occurred for those students demonstrating the highest levels of acceptance. However, the smallest gains occurred for those students demonstrating the next-to-the-lowest levels of acceptance. No definite pattern is discernible among these variables.
7. **Other.** No differences were found among the gains of students of different sex or at different grade-equivalent achievement levels. The STD student programming appears to have been relevant for both sexes and for students at different levels of achievement.

TABLE 27
A Characterization of Those Students Demonstrating the Largest and Smallest Gains in Knowledge and Attitudes

	Knowledge and Attitude Tests									
	"Time Out" Test		CMI "Domain of Career" Tests						CMI Attitude	
			Part I Career Awareness		Part II Self-Assessment		Part III Decision-Making			
Characteristics	Largest Gain	Smallest Gain	Largest Gain	Smallest Gain	Largest Gain	Smallest Gain	Largest Gain	Smallest Gain	Largest Gain	Smallest Gain
Age	14	15	NS	NS	NS	NS	NS	NS	NS	NS
Sex	NS	NS	NS	NS	female	male	female	male	NS	NS
Grade	9th	10th & Above	NS	NS	NS	NS	NS	NS	NS	NS
Ethnic Groups	Mex. Am.	Nat. Am.	NS	NS	NS	NS	NS	NS	NS	NS
Achievement Level	NS	NS	10th & above	6th & below	10th & above	4th & below	NS	NS	NS	NS
Locus of Control Levels	third quartile	first quartile	fourth quartile	first quartile	third quartile	first quartile	fourth quartile	first quartile	fourth quartile	first quartile
Teacher acceptance Levels	fourth quartile	second quartile	NS	NS	NS	NS	NS	NS	NS	NS
Student Acceptance Levels	fourth quartile	second quartile	fourth quartile	second quartile	fourth quartile	second quartile	fourth quartile	second quartile	NS	NS

NS = Not Significant

(2) Performance On the Various Parts of the Competence Test of the Career Maturity Inventory ("Domain of Career Education").

Findings. Referring to Table 27, those students demonstrating the largest learning gains within the "Domain of Career Education": (a) were female; (b) were achieving at the 10th grade level or above; (c) were generally motivated by something within themselves; and (d) demonstrated the highest levels of acceptance.

Those students demonstrating the smallest gains: (a) were males; (b) were achieving at the fourth grade level or lower; (c) were generally motivated by their external environment; and (d) demonstrated the next-to-the-lowest levels of acceptance.

Discussion. These findings suggest:

1. **Sex.** Sex was found to be a factor related to the [illegible]ment of students within the "Domain of Career Educ[illegible]" Female students demonstrated larger gains in self-assessment and decision-making than did male students. These findings could be attributable to two factors: (a) the elimination of sex stereotyping, especially within the area of specific careers; and (b) the overall tendency of junior high school females to excel academically.

2. **Grade-Equivalent Achievement Level.** Within the "Domain of Career Education," the largest average gain scores occurred for those students achieving at the 10th grade level and above. The lowest gains occurred for those students achieving at the sixth grade level or fourth grade level and below. However, those students achieving at the fifth grade level frequently demonstrated higher average gains than did those achieving at the seventh or eighth grade levels. No consistent pattern is discernible between these variables.
3. **Locus of Control.** Those students most motivated by their external environment achieved the lowest gain scores and those most motivated by something within themselves achieved the highest gain scores. This pattern is generally true for all levels of Locus of Control.
4. **Level of Student Acceptance.** In general, those students demonstrating the highest levels of acceptance achieved the largest average gains. However, the lowest average gains were achieved by those students with the next-to-the-lowest levels of acceptance. No definite relationship is discernible between acceptance and learning. While these findings suggest that acceptance of programming may be an important consideration in the design of programming, it is possible that other variables should either take precedence or be given equal consideration.
5. **Other.** No differences in knowledge gains were found among students of different ages, of different ethnic backgrounds, or in different grades. There were also no differences found among students with teachers demonstrating different levels of acceptance.

These results indicate that in the "Domain of Career Education" STD programming was relevant for its target audiences and for all students, regardless of ethnic background.

(3) Performance on the CMI Attitude Scale.

Findings. Referring to Table 27, those students demonstrating the largest gains in attitudes were most motivated by something within themselves, and those students achieving the smallest gains were most motivated by their external environment. No differences were found among groups differentiated by other characteristics.

Discussion. In terms of attitudes, STD programming was relevant for its intended audience.

OVERVIEW OF THE INTERACTIVE SYSTEM

A major area of inquiry which influenced every activity of the Demonstration — from the design of hardware to the development of programs, support services, materials, and evaluation efforts — concerned the audio interactive system used by members of the primary audience (junior high school students).

This section draws together findings from several of the preceding evaluation studies to present an overview of the impact of the interactive system on the primary audience.

Two major patterns are discernible in these studies. First, among members of the primary audience, the interactive system was associated with positive learning gains. On all knowledge and attitude tests, students at interactive sites demonstrated larger learning gains than did students at sites without the interactive capability. These findings have been presented in Tables 28 and 29.

TABLE 28
The Cell Means for the Analysis of Variance Performed on the Knowledge Gains of Students at Different Types of Sites

	Type of Site			
Tests	Intensive	Receive-Only	Open	Comparison
"Time Out" Test	7.16	6.06	6.20	2.98
CMI—Total	3.11	1.32	- 0.55	- 1.09
CMI—Part I	0.73	0.18	0.34	- 0.67
CMI—Part II	0.91	0.34	0.29	- 0.53
CMI—Part III	1.30	0.78	0.44	- 0.03

TABLE 29
The Cell Means for the Analyses of Variance Performed on the Attitude Gain Scores of Students at Different Types of Sites

Types of Sites	Mean	N
Intensive	3.34	371
Receive-Only	2.38	533
Open	1.54	208
Comparison	0.91	105

The second pattern which emerges from these studies is that among the primary audience, the interactive system was associated with larger levels of general acceptance of the Demonstration. Overall, students at interactive sites demonstrated a markedly higher level of acceptance for the STD than did students at non-interactive sites. The indicator of general acceptance of the STD was student responses to the question, "Would you like to see the STD class continued for future junior high school students?" The findings have been presented in Table 30.

TABLE 30

Distribution of Student Responses on the Question of Continuation of STD By Type of Site

Type of Site	Percentage of Students by Response			
	Yes	No	Maybe	N
Intensive	73.2	6.2	20.5	385
Receive-Only	62.9	9.7	27.4	606

As a demonstration, the STD was a unique exercise in applied social action, not a tightly controlled laboratory experiment. It should be emphasized that the findings on interaction presented here are derived from a study of the STD. Learning outcomes and acceptance levels may have been affected by variables peculiar to this demonstration. However, to the extent that future undertakings parallel the STD, these findings on the efficacy of interaction are highly relevant and can serve as useful guideposts in their design and implementation.

SUMMARY REPORT ON THE ACCEPTANCE AND USE OF THE MATERIALS DISTRIBUTION SERVICE

The data concerning the use and acceptance of the Materials Distribution Service (MDS), the most positively rated service of the STD, have been reported in this section.

Indicator. Information on the number and titles recorded and shown at each site and teacher ratings of the materials were derived from a weekly report prepared by the CD teacher and/or site coordinator.

Findings. Fifty-four of the fifty-six participating schools purchased from school district funds the videotape cassette recorders necessary to use the service. During the two semesters, these sites made a total of 7,068 recordings and 4,709 showings of the titles broadcast; this was an average of 87 showings per site during the school year. The documented audience attendance was 190,078. (See Table 31.)

TABLE 31
Attendance, Showings, and Recordings for MDS

Attendance	First Semester	Second Semester	Total
Elementary	24,736	34,213	58,949
Junior High	43,298	31,778	75,076
High School	34,128	19,630	53,488
Adult-Other	1,729	936	2,565
Totals	103,891	86,187	190,078

Overall, teachers rated the content of MDS materials as "very appropriate" to the curriculum and to the grade level. In comparison to rental films, teachers said the MDS was more up to date and more readily available.

Observations and interviews at the "Case Study" sites indicated that:

1. Teachers used MDS materials both as a supplement and as an alternative to rental films.
2. Staff members indicated that catalog descriptions were comprehensive enough to allow use of materials without previewing.
3. Students discussed the content of MDS materials at home.
4. Compared to the use of a movie projector, staff members preferred the quiet operation and simplicity of the video equipment which could be used in a lighted room.
5. Several sites implemented methods of sharing MDS recordings with other schools and the community, including making viewing facilities available outside school hours and providing copies of recordings to other schools in the district.

Discussion. The limitation of equipment and videotapes at the local sites greatly affected the use of MDS titles. Most sites were able to purchase only one tape recorder (VTR), one television monitor, and a few dozen cassette tapes (tape stock). Therefore, the number of MDS showings was limited to those titles which could be scheduled using one set of equipment. Although several sites had to use their tapes repeatedly and could retain material for only a few weeks, other sites were able to purchase sufficient tape stock to retain the full library throughout the school year.

Equipment malfunction was another limitation on the use of the service. While the unit was being repaired, no one could use the titles on hand or record new titles. Some sites had cooperative arrangements to record for one another when necessary. Another site, which had duplication equipment, offered to make copies for any other site which had missed a broadcast.

The copyright negotiations for continued use of MDS holdings after the end of the STD were viewed with mixed feelings by the sites. Some allocated funds to cover the royalty costs for their entire library. Some selected titles they wished to retain, hoping to cut the costs. Others developed sharing relationships with neighboring schools to reduce the cost. A few sites ceased recording MDS broadcasts.

The STD's demonstrated ability to provide excellent and timely supplementary materials (MDS) to support classroom instruction in all content areas was termed a success. Many teachers wanted MDS to continue and to be expanded.

TECHNICAL DOCUMENTATION OF STUDENT ACCEPTANCE OF THE STD

A more detailed technical analysis of student acceptance and an overview of the population and data analysis methodologies have been presented in this section.

The purpose of the "Student Acceptance Study" was to collect, describe, and analyze data on student acceptance of the STD career education class and related products and services. This study addressed the following questions:

1. What were the expressed opinions of students regarding the STD class and related products and services?
2. Were there any differences in expressed opinions between or among students with different characteristics?
3. What was the relationship between student acceptance and teacher acceptance?

POPULATION

The population for this study consisted of two groups: (1) the first semester students participating at Intensive and Receive-Only Sites; and (2) the second semester students participating at Intensive, Receive-Only and Open Sites. Following is a brief description of those students participating during each semester.

FIRST SEMESTER POPULATION

At Intensive and Receive-Only Sites, 1,637 students were identified as evaluation subjects. Complete demographic data were available for 86 percent of these subjects, and complete acceptance data were available for 61 percent. The demographic data have been presented in Table 32.

The total semester population contained: (1) a slightly unequal distribution of males and females (53.5 and 46.5 percent, respectively); and (2) an unequal distribution across grade levels, with 51.8 percent of the students being in the eighth grade.

TABLE 32
A Characterization of the First Semester Student Population by Sex, Grade, and Ethnicity

Characteristics	N	Percent
Sex	1,474	
Male		53.5
Female		46.5
Grade	1,462	
Seventh		29.1
Eighth		51.8
Ninth		16.1
Tenth and Above		3.0
Ethnicity	1,441	
Mexican American		16.4
Native American		15.0
Anglo		67.9
Other		0.6

The first semester population had an average age of 13.08 years and an average grade-equivalent achievement level of 6.94. The standard deviations were 1.05 and 2.08, respectively.

SECOND SEMESTER POPULATION

Since the general conclusions on student acceptance were based largely on second semester data, the second semester population has been described in more detail.

During the second semester, 1,823 students at Intensive, Receive-Only, and Open Sites were identified as evaluation subjects. Complete demographic data were available on 98 percent of these subjects and complete acceptance data on 71 percent. Second semester student demographics have been presented in Table 33.

The total second semester student population contained: (1) a slightly unequal distribution of males and females (50.7 and 49.3 percent, respectively); and (2) an unequal grade distribution, with over 50 percent of the students being in the eighth grade. It should be noted, however, that the distribution of students within demographic categories varied greatly by type of site.

The second semester total population had an average age of 13.49 and an average grade-equivalent achievement level of 7.33.

Where data from specific sub-groups have been used in answering specific questions, they have been described in conjunction with the relevant data analysis discussion.

TABLE 33
Percentages for Sex, Grade, and Ethnic Categories for all Second Semester Students at Each Type of Site

Characteristic	Intensive		Receive-Only		Open		Comparison		All	
	Percent	N	Percent	N	Percent	N	Percent	N	Percent	N
Sex		610		858		342		114		2005
Male	50.00		52.21		47.95		49.12		50.72	
Female	50.00		47.79		52.05		50.88		49.28	
Grade		617		828		341		112		1968
Seventh	30.96		22.71		30.79		13.39		26.98	
Eighth	34.85		66.79		48.39		72.32		53.46	
Ninth	32.09		9.90		12.90		14.29		17.28	
Tenth and above	2.10		.60		7.92				2.28	
Ethnicity		599		852		339		47		1969
Mexican Amer.	10.68		17.61		22.12		4.26		15.13	
Native Amer.	25.38		4.34		2.95		4.26		10.67	
Anglo	61.77		77.11		74.34		85.11		72.73	
Other	2.17		.94		.58		6.39		1.47	

DATA ANALYSIS METHODOLOGIES

All student acceptance data were gathered through the administration of opinion questionnaires at the end of each semester. Data analysis techniques varied and have been discussed separately for each question.

DATA ANALYSIS METHODOLOGIES FOR QUESTION 1

What Were the Expressed Opinions of Students Regarding the STD Class and Related Products and Services?

To describe the opinions of students, all data relative to Question 1 were analyzed through the calculation of descriptive statistics, including frequencies, means, standard deviations, and percentages. The data used in the analyses were collected from: (1) first semester students at Intensive and Receive-Only Sites; and (2) second semester students at Intensive, Receive-Only, and Open Sites.

DATA ANALYSIS METHODOLOGIES FOR QUESTION 2

Were There Any Differences In Expressed Opinions Between or Among Students With Different Characteristics?

To investigate differences in expressed opinions between or among students with different characteristics, all data were analyzed through t-tests or analysis of variance techniques (t-test for two groups, analysis of variance techniques for three or more groups). Since random sampling procedures were not used to select members of the tested population, statements regarding the applicability of the results to other populations cannot be made. However, it was felt that the use of selected inferential statistics, such as the t-test, could yield insights regarding the larger universe if the assumption was made that the STD population was representative of that larger universe.

In addition, the valid use of one-way analysis of variance is dependent upon meeting three assumptions: (1) that each group's scores have a normal distribution; (2) that each group's scores have the same variance; and (3) that the error components have statistical independence (Hays, William L. **Statistics,** 1963).

The meeting of assumption three regarding the independence of errors is automatically assured when random sampling procedures have been employed. When such procedures have not been utilized, as was the case with the STD, there are no means by which to determine whether or not this assumption has been violated.

In general, when the numbers of students are equal across the groups to which the one-way analysis of variance techniques have been applied, the violations of assumptions two and three (homogeneity of variance and normal populations) have been shown to be of little consequence (Box, George P. **The Annals of Mathematical Statistics,** 1964). However, for most of the F-tests reported in this document, unequal numbers of students across groups did occur. In such cases, a statistical test is available for testing the possible violations of assumptions one and two, the Bartlett Test (Dayton, C. Mitchell. **The Design of Educational Experiments,** 1970). Therefore, for each significant F-ratio which occurred, the Bartlett Test statistic was applied. It should be recognized that a significant Chi-square value resulting from the Bartlett Test does not mean that the F-test is automatically invalid, it merely means that the significance of the F-ratio must be considered suspect and accepted with caution.

All statistical tests for significant differences were performed on the scores of Intensive, Receive-Only, and Open Site students.

More complicated data analyses could have been performed on the data (e.g., two-, three-, or four-way analyses of variance, multivariate techniques). However, resource and time constraints dictated that only preliminary analyses be performed. The data are available for other researchers to conduct more extensive investigations.

DATA ANALYSIS METHODOLOGIES FOR QUESTION 3

What was the Relationship between Student Acceptance and Teacher Acceptance?

The relationship between teacher and student acceptance was described by the calculation of a Pearson Product-Moment correlation coefficient. The resulting coefficient was then squared to obtain a value which would describe the amount of variance in teacher acceptance accounted for by the variance in student acceptance and vice versa (Coefficient of Determination). The scores utilized in the analyses were obtained by computing: (1) the average of a teacher's weekly ratings of the STD class across the second semester; and (2) the average of their students' weekly ratings of the class across the same time frame.

DATA ANALYSIS RESULTS

Data analysis results have been discussed separately for each question.

DATA ANALYSIS RESULTS FOR QUESTION 1

What Were the Expressed Opinions of Students Regarding the STD Class and Related Products and Services?

This section has described the expressed opinions of both first and second semester students on: (1) the STD class; and (2) the five major products related to the class.

Acceptance of the STD Class.

The indicator of student acceptance of the STD class was student responses to the question, "Would you like to see the STD class continued for future junior high students?" A distribution of the student responses has been presented in Table 34.

TABLE 34
The Percentage of Students Responding Yes, No, or Maybe, to Question Regarding the Continuation of the STD Class

Response	First Semester* Percent	N	Second Semester** Percent	N
Yes	66.9	663	60.6	766
No	8.4	83	13.4	170
Maybe	24.7	245	25.9	328

* Students at Intensive and Receive-Only Sites
**Students at Intensive, Receive-Only, and Open Sites

Acceptance of the Five Products Related to the STD Class

Student opinions were solicited regarding: (1) the pre-taped "Time Out" program series; (2) the live interactive program series, "Time In"; (3) the live interactive program series, "Time for You"; (4) the student magazine; and (5) the audio interaction (two-way communication) system. Students were asked to rate each of the first four products in terms of its: information, helpfulness, and interest. All ratings were made on four-point scales (1 = low rating, 4 = high rating). In the "Summary Report," these data have been reported in terms of percentages. In this section, they have been described in terms of means and standard deviations (Tables 35 and 37). Students were also asked to indicate the amount which they felt the interactive system had contributed to their understanding of program content. All data analyses results have been presented separately for first and second semester students.

First Semester Acceptance Results. On all four scales, the first semester students gave the highest ratings to the pre-taped "Time Out" program. The student magazine received the lowest ratings in terms of information and helpfulness. The lowest ratings occurred for the "Time for You" programs in terms of interest. In all cases, the live interactive programs received lower ratings than did the pre-taped "Time Out" programs. These data have been presented in Table 35.

TABLE 35

The Means, Standard Deviations, and N's for First Semester Student Responses to Questions Concerning the Amount of Information Gain, Helpfulness, and Interest Attributable to Four STD Products

Attributes/Programs	Mean	Standard Deviations
Amount of Information Gained		
"Time Out"	3.13	0.76
"Time In"	2.65	0.88
"Time for You"	2.50	0.94
Student Magazine	2.44	0.87
Degree of Helpfulness		
"Time Out"	3.05	0.89
"Time In"	2.59	1.01
"Time for You"	2.37	1.01
Student Magazine	2.29	0.95
Degree of Interest		
"Time Out"	3.05	0.85
"Time In"	2.59	1.00
"Time for You"	2.31	1.06
Student Magazine	2.59	0.94

Note: Average N = 936
(1 = low rating, 4 = high rating)

First semester results indicated that 91.6 percent of the students would like to see the programs continued; second semester results indicated that 86.5 percent of those participating would like to see the programs continued.

When asked to describe how much the interactive format contributed to their understanding of program content, 68 percent of those first semester students capable of interacting (IT Sites) gave positive responses. These data have been presented in Table 36.

TABLE 36

The Percentage of Intensive and Receive-Only First Semester Students Selecting Responses Which Describe the Contribution to Learning Made by the Interaction System.

	Intensive Students		Receive-Only Students	
Responses	Percent	N	Percent	N
A Great Deal	26.2	101	10.4	54
Much	41.5	160	26.8	134
Very Little	26.2	101	23.6	122
None	6.2	24	39.2	203

The differences described in Table 36 indicate that having the capability to use the audio interactive system greatly affected that system's acceptance. Of the Intensive Site students, 63.5 percent used the system an average of 2.46 times during the semester. Of these students, 83 percent described the interactive equipment as being "very easy" or "fairly easy" to operate.

Second Semester Acceptance Results. The opinions of second semester students at Intensive and Receive-Only Sites were solicited on all five products; the opinions of Open Site students were solicited on four of the five products: "Time Out," "Time for You," the student magazine, and the interaction system. ("Time In" was not re-broadcast by the participating public television stations.)

Second semester students perceived the pre-taped "Time Out" program as being the most informative and helpful of all the products. Both "Time Out" and the student magazine received the highest ratings in terms of interest. Both live interaction programs received lower ratings on all three scales than did the pre-taped "Time Out" program. These data have been presented in Table 37.

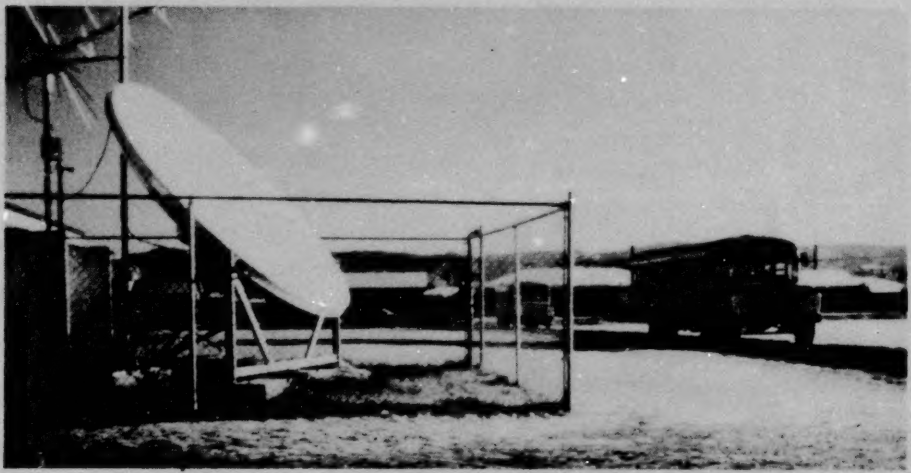


TABLE 37
The Means, Standard Deviations, and N's for Second Semester Student Responses to Questions Concerning the Amount of Information Gain, Helpfulness, and Interest Attributable to Four STD Products

Attributes/Programs	Mean	Standard Deviations	N
Amount of Information Gained			
"Time Out"	2.90	0.83	1,254
"Time In"	2.55	0.85	941*
"Time for You"	2.55	0.89	1,113
Student Magazine	2.42	0.91	1,207
Degree of Helpfulness			
"Time Out"	2.77	0.94	1,227
"Time In"	2.47	0.98	942*
"Time for You"	2.42	0.97	1,111
Student Magazine	2.33	0.96	1,135
Degree of Interest			
"Time Out"	2.66	0.98	1,240
"Time In"	2.37	0.99	955*
"Time for You"	2.43	1.04	1,116
Student Magazine	2.66	0.94	1,129

*"Time In" was not received and therefore was not rated by students at Open Sites.

When asked to indicate how much the interactive system contributed to their understanding of program content, 48.3 percent of the second semester students responded "a great deal" or "much." It should be noted that these figures were based on the responses of all students; approximately two-thirds of these students participated at sites without the interactive capability (ROT Sites) and these students tended to give lower ratings to the system than did those students at sites with the interactive capability (IT Sites).

During the second semester, the STD experimented with three basic types of Friday interaction programs: (1) programs with STD personnel serving as moderators; (2) programs with experts in post-secondary options serving as moderators; and (3) programs produced by students at Intensive Sites.

When student preferences among these types of programs were solicited, the site-produced programs were selected as the most favorite type by more students (43.3 percent) than any other type. Moreover, of those students involved in producing their own programs (15.8 percent of the total study population), 74.4 percent indicated that they had learned "a great deal" or "much." These findings suggest the importance of including students in the design and production of student programming.

Differences Between the First and Second Semester Acceptance Results

As previously stated, the first semester broadcast of the STD student programs was formative in nature, providing data for program revision. The second semester was summative. The differences in acceptance occurring between the two semesters may be attributable in part to the effect of the formative efforts.

Second semester students showed slightly lower levels of acceptance of the STD class on all indicators than did first semester students. Specifically, second semester students perceived a lower level of information gained than did first semester students. However, as shown in the section in which the "Student Learning Gains Study" has been discussed, the amount of information actually gained by second semester students was greater than that gained by first semester students. These data have been presented in Table 38.

TABLE 38
The Average Ratings of the Career Education Class for the Formative and Summative Semesters and the Amount of Change between the Average Ratings of the Two Semesters

Program Attributes	Means Formative Semester	 Summative Semester	Amount of Change
*Compared to a Regular Classroom Lesson	3.96	3.60	- 0.36
*Amount of Information Gained	3.82	3.62	- 0.20
**Helpfulness of Information	3.20	3.09	- 0.11
**Degree of Interest	3.20	3.02	- 0.18

*On a five-point scale (1 = low rating, 5 = high rating)
**On a four-point scale (1 = low rating, 4 = high rating)

The changes in acceptance between the two semesters (Table 38) could have resulted from two different factors. The formative modifications made prior to the second semester were designed to enhance the educational effectiveness of the programs and to de-emphasize the entertainment aspects of the J-Series. This might have impacted on student acceptance and student learning gains. In addition, since 63.3 percent of the second semester students were aware of the career education class prior to their participation, the slight decrease in acceptance might have resulted from a lessening of the Hawthorne effect (i.e., student acceptance decreased as the excitement of experimental participation decreased).

Summary of Conclusions for Question 1

The data analysis results described in this section indicate that the STD class was accepted by participating students. The pre-taped "Time Out" programs were perceived to be more informative, interesting, and helpful than were either of the interactive programs. In addition, approximately half of the participating students perceived the interaction system to be making a contribution to their learning processes.

DATA ANALYSIS RESULTS FOR QUESTION 2

Were There Any Differences in Expressed Opinions Between or Among Students with Different Characteristics?

Second semester students were asked to rank: (1) the STD class as it compared to a regular classroom lesson (1 = low ratings, 5 = high ratings); (2) the amount of information gained in the STD class (1 = low ratings, 5 = high ratings); and (3) the helpfulness of that career-related information (1 = low ratings, 4 = high ratings). In addition, students at Intensive and Receive-Only Sites were asked to respond to an additional item regarding the contribution of the interaction system. Separate analyses were performed for type of site, age, sex, grade, ethnicity, and achievement.

Type of Site. To investigate differences among the ratings of the STD class by students at different types of sites (Intensive, Receive-Only, and Open), student responses to the previously described four items were analyzed by one-way analysis of variance. Analysis of the data revealed four F-ratios ranging from 17.17 to 39.02, all of which were found to be significant. These data have been presented in Table 39.

TABLE 39
The Degrees of Freedom, Sums of Squares, and F-Ratios of the General Acceptance Responses for Students at Intensive, Receive-Only, and Open Sites

Program Attributes	Degrees of Freedom	Sums of Squares	F-Ratio
Compared to a Regular Lesson:			
Between Groups	2	88.81	
Within Groups	1,272	1482.55	38.10*
Amount of Information Gained:			
Between Groups	2	70.31	
Within Groups	1,260	1135.26	39.02*
Degree of Helpfulness:			
Between Groups	2	26.41	
Within Groups	1,257	966.90	17.17*
Degree of Interest:			
Between Groups	2	36.71	
Within Groups	1,265	1035.63	22.42*

*P less than .05

To test the homogeneity of variance assumption underlying the F-tests, Bartlett statistics were calculated for all significant F-ratios. These analyses revealed four Bartlett Chi-square values ranging from 2.30 to 26.73. Three of these were found to be significant, indicating that the relevant F-ratios must be accepted with caution. The F-ratio for the amount of information gained during the STD class can be accepted as indicating significant differences among students at different types of sites. These data have been presented in Table 40.

TABLE 40
The N's, Variances, and Bartlett Chi-square Values for the General Acceptance Responses of Students at Different Types of Sites

Program Attributes/Type of Site	N	Variance	Bartlett Chi-Square Value
Compared to a Regular Lesson:			
Intensive	405	1.05	
Receive-Only	629	1.24	
Open	241	1.17	8.69*
Amount of Information Gained:			
Intensive	402	0.94	
Receive-Only	621	0.89	
Open	240	0.80	2.03
Degree of Helpfulness:			
Intensive	402	0.69	
Receive-Only	620	0.77	
Open	238	0.91	13.58*
Degree of Interest:			
Intensive	404	0.68	
Receive-Only	624	0.84	
Open	240	0.01	26.73*

*P less than .05
NOTE: DF = 2

An examination of the means for the type-of-site groups (Table 41), revealed that, for all program attributes, the highest average ratings occurred for the Intensive Site students, and the lowest average ratings occurred for the Open Site students.

These results indicate that the ability to participate in audio interaction enhanced student acceptance of the STD class.

TABLE 41
The Cell Means for the Analyses of Variance Performed on the General Acceptance Ratings of Students at Intensive, Receive-Only, and Open Sites

Program Attributes	Intensive	N	Receive-Only	N	Open	N
Compared to a Regular Lesson:	3.93	405	3.54	629	3.17	241
Amount of Information Gained:	3.96	402	3.50	621	3.37	240
Degree of Helpfulness:	3.30	402	3.00	620	2.98	238
Degree of Interest:	3.26	404	2.95	624	2.82	240

In addition to the preceding analysis, the responses of students at Intensive and Receive-Only Sites regarding the contribution of the interaction system were also analyzed via a t-test. The resulting t-value of 12.92 was found to be significant. An examination of the means revealed that the average rating of the Intensive Site students was higher than that of the Receive-Only Site students. These data have been presented in Table 42.

TABLE 42
The Means, Standard Deviations, and t-Values for the Responses of Students at Intensive and Receive-Only Sites Regarding the Contribution of the ATS-3 Interaction System

Groups	Mean	Standard Deviations	N	t-Value
Intensive	2.88	0.89	367	
Receive-Only	2.06	0.97	543	12.92*

*P less than .05

Sex. The significance of the differences between the ratings of the STD class by males and females were examined by t-tests. Analyses of the data revealed four t-values ranging from 0.70 to 1.67. The t-value for the helpfulness of the class was found to be significant. An examination of the means revealed that the female students gave higher helpfulness ratings than did the male students. These data have been presented in Table 43.

TABLE 43
The Means, Standard Deviations, and t-Values for the General Acceptance Responses of Male and Female Students

Program Attributes/Sex Groups	Mean	Standard Deviations	N	t-values
Compared to a Regular Lesson:				
Males	3.59	1.13	621	
Females	3.65	1.06	602	0.96
Amount of Information Gained:				
Males	3.62	0.97	616	
Females	3.66	0.95	598	0.70
Degree of Helpfulness:				
Males	3.06	0.89	610	
Females	3.15	0.87	600	1.67*
Degree of Interest:				
Males	3.01	0.94	615	
Females	3.05	0.89	600	0.80

*P less than .05

GAME CARDS
GAME CARDS

Age. To investigate the significance of the differences found among the STD class ratings of students of different ages (12,13,14, and 15 year olds), one-way analysis of variance techniques were employed. Analyses of the data revealed four F-ratios ranging from 3.03 to 5.30, all of which were found to be significant. These data have been presented in Table 44.

TABLE 44
The Degrees of Freedom, Sums of Squares, and F-Ratios for the General Acceptance Responses of Students of Different Ages

Program Attributes	Degree of Freedom	Sums of Squares	F-Ratio
Compared to a Regular Lesson:			
Between Groups	3	18.88	
Within Groups	1,215	1438.57	5.30*
Amount of Information Gained:			
Between Groups	3	8.40	
Within Groups	1.206	1115.60	3.03*
Degree of Helpfulness:			
Between Groups	3	7.00	
Within Groups	1,202	926.10	3.03*
Degree of Interest:			
Between Groups	3	9.62	
Within Groups	1,207	1000.37	3.90*

*P less than .05

Information
Plan

To test the homogeneity of variance assumption underlying the F-tests, Bartlett statistics were calculated for all significant F-ratios. These analyses revealed Bartlett Chi-square values ranging from 7.34 to 20.12. Three of these were found to be significant, indicating that the relevant F-ratios must be accepted with caution. The F-ratio regarding the helpfulness of the class can be accepted as indicating significant differences. These data have been presented in Table 45.

TABLE 45
The N's, Variances, and Bartlett Chi-square Values for the General Acceptance Responses of Students in Different Age Groups

Program Attributes/Age Groups	N	Variance	Bartlett Chi-Square Value
Compared to a Regular Lesson:			
12	213	1.35	
13	521	1.15	
14	329	1.04	
15	159	1.40	14.08*
Amount of Information Gained:			
12	209	1.12	
13	518	0.83	
14	328	0.93	
15	155	0.99	15.94*
Degree of Helpfulness:			
12	208	0.84	
13	516	0.72	
14	329	0.75	
15	153	0.89	7.34
Degree of Interest:			
12	212	0.95	
13	517	0.73	
14	328	0.81	
15	154	1.03	20.12*

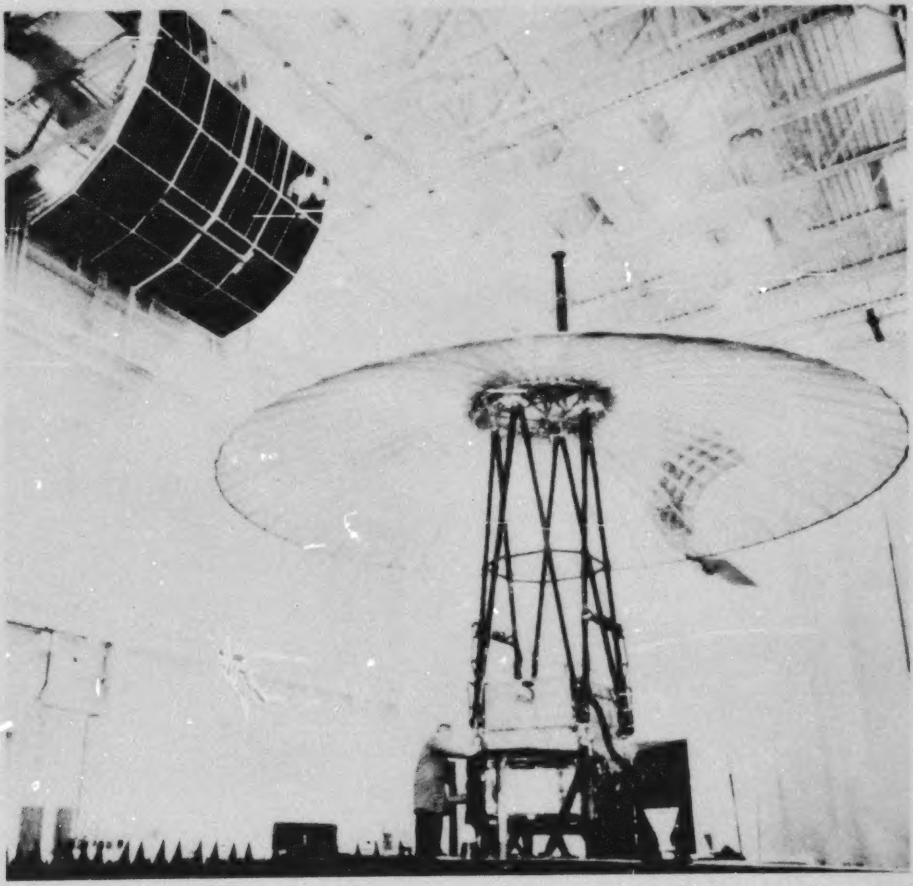
*P less than .05
NOTE: DF = 3

An examination of the means for the age groups (Table 46) revealed that, for three scales, the highest average ratings occurred for the 13 year old students. On the scale regarding the comparison between the STD class and a regular classroom lesson, the highest average rating occurred for the 13 and 14 year old students. On all scales, the lowest ratings occurred for the 15 year old students.

These results indicate, that in terms of age, the STD developed programming perceived as being relevant by the target audience.

TABLE 46
The Cell Means for the Analysis of Variance Performed on the Acceptance Responses of Students with Different Ages

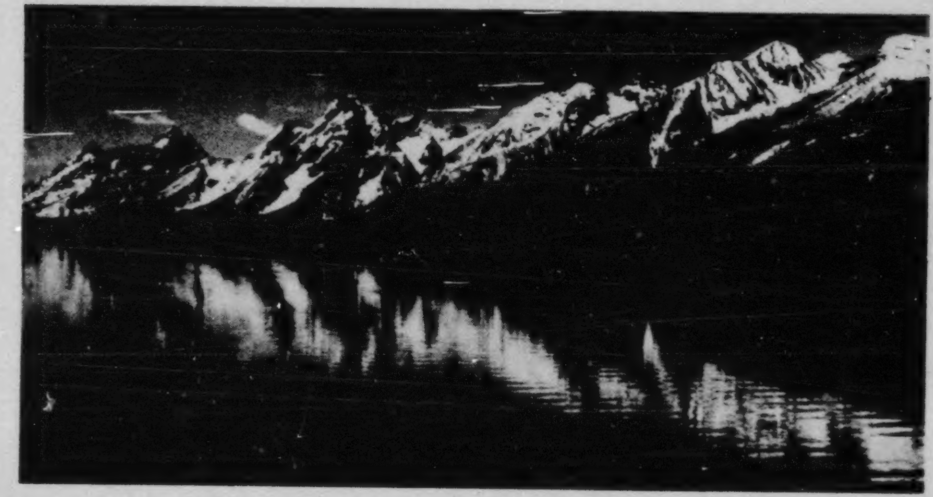
	Age							
Program Attributes	**12**	**N**	**13**	**N**	**14**	**N**	**15**	**N**
Compared to a Regular Class	3.53	213	3.69	521	3.70	329	3.34	159
Amount of Learning	3.62	209	3.70	518	3.65	328	3.43	155
Degree of Helpfulness	3.02	208	3.17	516	3.12	329	2.97	153
Degree of Interest	2.97	212	3.10	517	3.05	328	2.83	154



Grade. Significant differences were found among the acceptance responses of students at different grade levels (7th, 8th, 9th, 10th and above). Analyses of the data revealed four F-ratios ranging from 3.93 to 9.93, all of which were found to be significant. These data have been presented in Table 47.

TABLE 47
The Degrees of Freedom, Sums of Squares, and F-Ratios of the General Acceptance Responses for Students at Different Grade Levels

Scale	Degree of Freedom	Sums of Squares	F-Ratio
Compared to a Regular Lesson:			
Between Groups	3	34.80	
Within Groups	1,193	1,393.47	9.93*
Amount of Information Gained:			
Between Groups	3	12.81	
Within Groups	1,184	1,086.41	4.65*
Degree of Helpfulness:			
Between Groups	3	9.07	
Within Groups	1,180	907.31	3.93*
Degree of Interest:			
Between Groups	3	16.23	
Within Groups	1,185	971.99	6.60*



To test the homogeneity of variance assumption underlying the F-tests, Bartlett statistics were calculated for all significant F-ratios. These analyses revealed Bartlett Chi-square values ranging from 10.59 to 19.67, all of which were found to be significant. All of the significant F-ratios found for students at different grade levels must be considered suspect. These data have been presented in Table 48.

TABLE 48
The N's, Variances, and Bartlett Chi-square Values for the General Acceptance Responses of Students at Different Grade Levels.

Program Attributes/Grade Levels	N	Variance	Bartlett Chi-Square Value
Compared to a Regular Lesson:			
7th	369	1.33	
8th	648	1.05	
9th	146	1.16	
10th and above	34	1.70	19.67*
Amount of Information Gained:			
7th	864	1.01	
8th	645	0.85	
9th	146	0.91	
10th and above	33	1.37	15.36*
Amount of Helpfulness:			
7th	362	0.81	
8th	645	0.75	
9th	143	0.65	
10th and above	34	1.23	16.02*
Amount of Interest:			
7th	366	0.89	
8th	644	0.76	
9th	144	0.85	
10th and above	33	1.13	10.59*

*P less than .05
NOTE: DF = 3

An examination of the means (Table 49) for the grades revealed that, across all scales, the highest average acceptance ratings occurred for the 8th grade students. The lowest average ratings occurred for the students in the 10th grade and above.

These results indicate that the STD successfully generated programming for a specific audience (i.e., the 7th, 8th, and 9th graders).

TABLE 49
The Cell Means for the Analysis of Variance Performed on the General Acceptance Responses of Students at Different Grade Levels

	Grade Levels			
Scale	7th	8th	9th	10th and above
Compared To a Regular Lesson:	3.61	3.73	3.48	2.77
Amount of Information Gained:	3.67	3.68	3.58	3.06
Degree of Helpfulness:	3.08	3.18	3.01	2.74
Degree of Interest:	3.01	3.10	2.96	2.42

Ethnicity. To test the significance of the differences found among the ratings of the STD class by students of different ethnic backgrounds (Anglo, Mexican American, and Native Americans), analysis of variance techniques were applied. Analyses of the data revealed four F-ratios ranging from 7.33 to 7.84, all of which were significant. These data have been presented in Table 50.

TABLE 50
The Degrees of Freedom, Sums of Squares, and F-Ratios of the General Acceptance Responses for Students of Different Ethnic Backgrounds

Scale	Degree of Freedom	Sums of Squares	F-Ratio
Compared to a Regular Lesson:			
Between Groups	2	17.42	
Within Groups	1,206	1432.59	7.33*
Amount of Information Gained:			
Between Groups	2	13.39	
Within Groups	1,197	1089.92	7.35*
Degree of Helpfulness:			
Between Groups	2	11.38	
Within Groups	1,193	906.49	7.49*
Degree of Interest:			
Between Groups	2	12.84	
Within Groups	1,198	980.89	7.84*

*P less than .05

To test the homogeneity of variance assumption underlying the F-tests, Bartlett statistics were calculated for all significant F-ratios. These analyses revealed Bartlett Chi-square values ranging from 0.87 to 21.68. Two of these were found to be significant, which indicates that the relevant F-ratios are suspect and must be accepted with caution. The F-ratios for the ratings relative to the amount of information gained and the helpfulness of that information can be accepted as indicating significant differences. These data have been presented in Table 51.

TABLE 51
The N's, Variances, and Bartlett Chi-square Values for the General Acceptance Responses of Students With Different Ethnic Backgrounds

Program Attributes/Ethnic Groups	N	Variance	Bartlett Chi-Square Value
Compared to a Regular Lesson:			
Anglo	918	1.22	
Mexican American	182	0.93	
Native American	108	1.36	13.38*
Amount of Information Gained:			
Anglo	912	0.91	
Mexican American	181	0.85	
Native American	107	1.00	0.87
Degree of Helpfulness:			
Anglo	907	0.78	
Mexican American	181	0.69	
Native American	108	0.71	2.64
Degree of Interest:			
Anglo	913	0.87	
Mexican American	181	0.66	
Native American	107	0.64	21.68*

*P less than .05
NOTE: DF = 2

An examination of the means (Table 52) for the ethnic groups revealed that, on two scales, the highest average ratings occurred for the Native American students; while on the remaining two scales, the highest average ratings occurred for the Mexican American students. On all scales, the lowest average ratings occurred for the Anglo students.

TABLE 52

The Cell Means of the Analyses of Variance Performed on the General Acceptance Ratings of Students With Different Ethnic Backgrounds

	Ethnicity					
Scale	Anglo	N	Mex. Amer.	N	Native Amer.	N
Compared to a regular lesson:	3.56	918	3.90	182	3.69	108
Amount of Information Gained:	3.58	912	3.80	181	3.87	107
Degree of Helpfulness:	3.04	907	3.30	181	3.25	108
Degree of Interest:	2.98	913	3.16	181	3.29	107

Grade-Equivalent Achievement Level. To test the significance of the differences found among the ratings of the STD class by students at different grade-equivalent achievement levels (4th and below, 5th, 6th, 7th, 8th, 9th, 10th and above), analyses of variance techniques were employed. Analyses of the data revealed four F-ratios ranging from 0.72 to 2.28. The F-ratio for the ratings regarding the comparison of the STD class with a regular classroom lesson was found to be significant. These data have been presented in Table 53.

TABLE 53

The Degrees of Freedom, Sums of Squares, Mean Squares, and F-Ratios for the General Acceptance Responses of Students at Different Achievement Levels

Scale	Degree of Freedom	Sums of Squares	F-Ratio
Compared to a Regular Lesson:			
Between Groups	6	16.48	
Within Groups	841	1013.51	2.28*
Amount of Information Gained:			
Between Groups	6	3.93	
Within Groups	835	760.92	0.72
Degree of Helpfulness:			
Between Groups	6	4.75	
Within Groups	833	633.95	1.04
Degree of Interest:			
Between Groups	6	8.31	
Within Groups	834	681.11	1.70

*P less than .05

To test the homogeneity of variance assumption underlying the significant F-test reported in Table 53, a Bartlett statistic was calculated. The resulting Chi-square value of 2.31 was found to be non-significant; therefore, the F-ratio for the ratings of the STD class in comparison to a regular classroom lesson can be accepted as indicating significant differences.

An examination of the means (Table 54) for the achievement groups revealed that, on a five-point scale, the highest ratings occurred for those students achieving at the fourth grade level or lower. The lowest average ratings occurred for those students achieving at the seventh grade level.

The lack of significant differences on three out of four acceptance scales indicates that the STD class was perceived as being informative, helpful, and interesting by all students, regardless of the level at which they were achieving.

TABLE 54
The Cell Means for the Analysis of Variance Performed on the Acceptance Ratings of Students at Different Achievement Levels

Program Attributes/Achievement Level	N	Mean
Compared to a Regular Lesson:		
4th and below	86	3.92
5th	87	3.61
6th	123	3.80
7th	156	3.48
8th	140	3.65
9th	106	3.55
10th and above	150	3.53

DATA ANALYSIS RESULTS FOR QUESTION 3

What is the Relationship Between Student Acceptance and Teacher Acceptance?

An examination of the relationship between teacher and student acceptance resulted in a Pearson Product-Moment correlation coefficient of +0.63. The squaring of this value (Coefficient of Determination) indicates that 39.54 percent of the variance in student acceptance can be accounted for by the variance in teacher acceptance or vice versa. Those teachers who participated in the STD pre-training program demonstrated the highest levels of acceptance. These results point to the importance of providing teachers with pre-orientations to educational media, especially in terms of its content, purpose, and desired learning outcomes.

TECHNICAL DOCUMENTATION OF ACCEPTANCE OF COMMUNITY-DIRECTED PROGRAMS ("FOOTPRINTS") BY AUDIENCE MEMBERS

DESCRIPTION OF THE SERIES

The "Footprints" series for adults consisted of the following 10 programs:

Broadcast Date	Program
Sept. 26, 1974	ORDER NO: 461111-LT7: An exploration of problems in the mail order business.
Oct. 17, 1974	THE SPACE BETWEEN US: An examination of interpersonal relationships, primarily dealing with "How to Fight."
Nov. 7, 1974	THE GREAT LAND RACE: An exploration of the "Boom Town" situation and its impact on people, resources, and the community.
Dec. 19, 1974	FOR PURPLE MOUNTAIN MAJESTY: A visual image of the cultural and geographical wealth of people and places in eight Rocky Mountain states.
Jan. 9, 1975	JOB JUNGLE: A review of the STD's daytime career series "Time Out" and an exploration of how to apply some of its principles to a career already in progress.
Jan. 30, 1975	SUPER COOPERATIVES: A look at the effect of cooperatives on farming today.
Feb. 20, 1975	MISTEROGERS! EVERY CHILD'S NEIGHBOR: An exploration of Fred Rogers, the man and the educator.
March 13, 1975	DOCTOR IN THE COUNTY: An exploration of medical needs in rural communities and various ways of meeting these needs.
April 3, 1975	DON'T HOLD US BACK: Pointers on ways in which senior citizens can strengthen their voice in the community.
April 24, 1975	BRASS TACKS: A look at the operational year of the STD as described by the participants themselves.

DATA COLLECTION METHODOLOGY

Audience acceptance of the "Footprints" series was assessed through an opinion questionnaire administered immediately after each broadcast.

With the administration of each questionnaire, respondents were told that they: (1) did not have to complete the questionnaire if they did not wish to; and (2) could omit any questions which they did not understand or which they preferred not to answer. This action was taken because of a possible negative reaction due to repetitive testing and because of possible reading difficulties on the part of some viewers. As a result, the possibility of bias in the data should be recognized.

VIEWER POPULATION

Audience attendance was reported by the site coordinator in the **Weekly Site Report**. According to data in these reports, a total of 2,932 people attended the evening programs; 74 percent (2,171) of these completed questionnaires.

The majority of the evening audience members were Anglos; the average years of schooling of the audience was 13.7. The evening audience viewed an average of 2.14 hours of commercial television per day. Data relative to sex and ethnicity have been presented in Table 55.

TABLE 55
Percentages of General Audience Members Within Sex and Ethnic Categories

Caharacteristics	N	Percent
Sex	1,963	
Male		47.7
Female		52.3
Ethnicity	1,933	
Anglo		83.0
Native American		7.6
Mexican American		4.4
Other		3.8

ACCEPTANCE OF THE SERIES AS A WHOLE

Viewers were asked to indicate: (1) whether the series should be continued; (2) whether home viewing of the series would be an improvement; and (3) whether the presence of other people contributed to their enjoyment of the program.

OPINION QUESTION RESPONSES

Of the audience, 84 percent indicated that they would like to see the series continued in their community. In spite of viewers' traveling an average of 6.6 miles to attend the programs, only 47.7 percent stated that being able to view the programs in their homes would be a real improvement; 21.9 percent stated that home viewing would not be an improvement; and 30.4 percent indicated uncertainty. These data have been presented in Table 56.

TABLE 56
Percentage of Responses to Yes/No Opinion Questions by "Footprints" Viewers

Question	N	Yes	No	Maybe
1. Like to see series continued?	2,170	83.7	2.8	13.5
2. Home viewing an improvement?	2,028	47.7	21.9	30.4
3. Presence of other people added to enjoyment?	2,055	92.4	7.6	--

RESPONSES TO THREE BASIC PRODUCTS AND SERVICES

Viewers were also asked to indicate: (1) the pleasurability and helpfulness of the television programs; (2) the pleasurability and helpfulness of the accompanying audio interaction; and (3) the helpfulness of the site coordinator's presence.

The presence of other viewers was considered to make a contribution to program enjoyment by 92.4 percent of the viewers. Based on viewer ratings of helpfulness, the three basic products and services incorporated into the series can be ranked as follows:

(1) the television program (rated as "helpful" by 71.4 percent);
(2) the accompanying live interaction (59.7 percent); and
(3) the presence of the site coordinator (38.2 percent).

It should be noted that viewers could select more than one response. These data have been presented in Table 57.

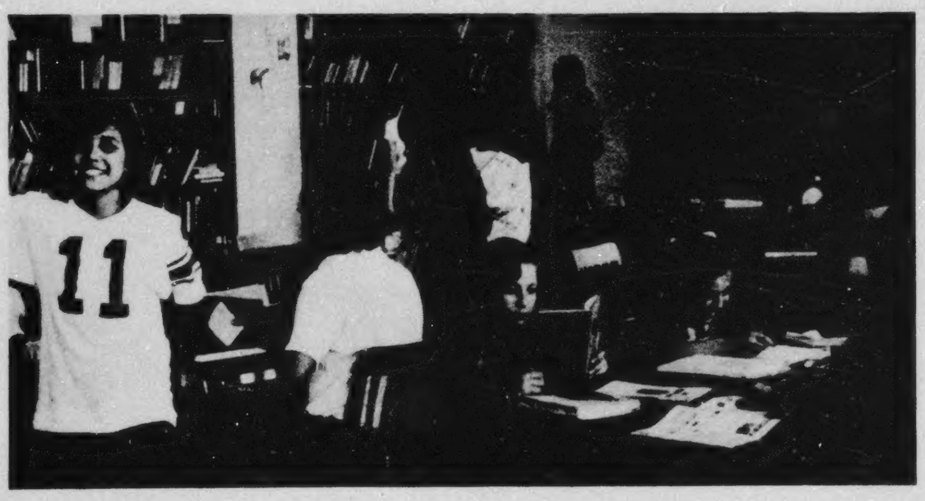


TABLE 57
Percentage of Viewers Selecting Responses Regarding STD Products and Services*

STD Products/Services	N	Percent
Television Program:		
A Pleasure	1,051	49.9
Helpful	1,503	71.4
Very Little Worth	99	4.7
Complete Waste of Time	19	.9
Audio Interaction:		
A Pleasure	846	43.3
Helpful	1,154	59.7
Very Little Worth	139	7.2
Complete Waste of Time	16	.8
Site Coordinator:		
Very Helpful	898	45.9
Helpful	748	38.2
Somewhat Helpful	150	7.7
Not Helpful	30	1.5

*Viewers asked to check all applicable responses. Therefore, percentages do not equal 100 percent.

REPEAT VIEWERS

Another indicator of acceptance of the series was the number of "repeat" viewers. For the first three programs, the majority of the audience were first-time viewers. For the remaining seven programs, the majority of the audience were repeat viewers (i.e., those who had viewed one or more "Footprints" programs). These data have been presented in Figure 21.

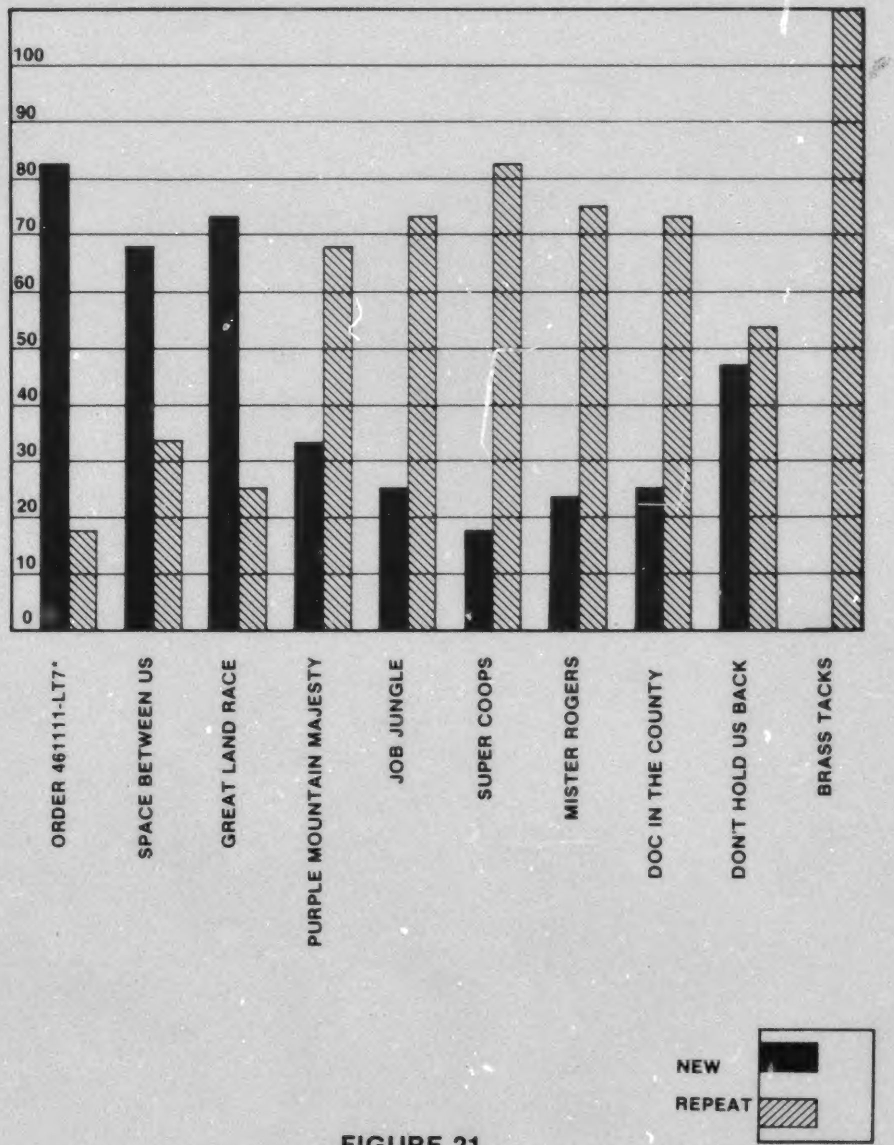


FIGURE 21

THE PERCENTAGE OF NEW VIEWERS VS. REPEAT VIEWERS FOR EACH STD EVENING PROGRAM

*Many viewers were previously exposed to taped versions of the "We Are Here" program.

An examination of the demographic characteristics of new and repeat viewers revealed few differences. These data have been presented in Tables 58 and 59.

TABLE 58
The New and Repeat "Footprints" Viewers Categorized by Various Demographic Characteristics

Characteristics	Percent	N	Percent	N
Ethnicity		838		675
Mexican American	3.6		4.3	
Native American	6.6		6.5	
Anglo	89.1		87.9	
Other	0.7		1.3	
Sex		906		596
Male	46.2		46.7	
Female	53.8		53.3	

TABLE 59
A Categorization of New and Repeat Viewers by Average Numbers of Miles Traveled, Years of Schooling, and Hours of Television Viewed Per Day

	New		Repeat	
	Mean	N	Mean	N
Miles Traveled	6.19	895	4.44	679
Years of Schooling	13.49	910	13.58	667
Hours of Television Viewed Per Day	2.01	889	2.23	687

The high acceptance of the "Footprints" series as indicated by the number of repeat viewers indicates that the content of the programs successfully addressed itself to the needs of isolated, rural communities and is a further indication that the STD fulfilled its commitment to be a user-based system.

ACCEPTANCE OF SPECIFIC PROGRAMS

AUDIENCE PERCEPTIONS OF PLEASURABILITY AND/OR HELPFULNESS

The first indicator of acceptance of specific programs is their respective pleasurability and helpfulness ratings. Data relative to audience perceptions regarding the pleasurability and helpfulness of each of the programs in the "Footprints" series have been presented in Figure 22. The data indicates that the majority of viewers perceived 9 of the 10 programs to be helpful and 6 of the 10 to be pleasurable.

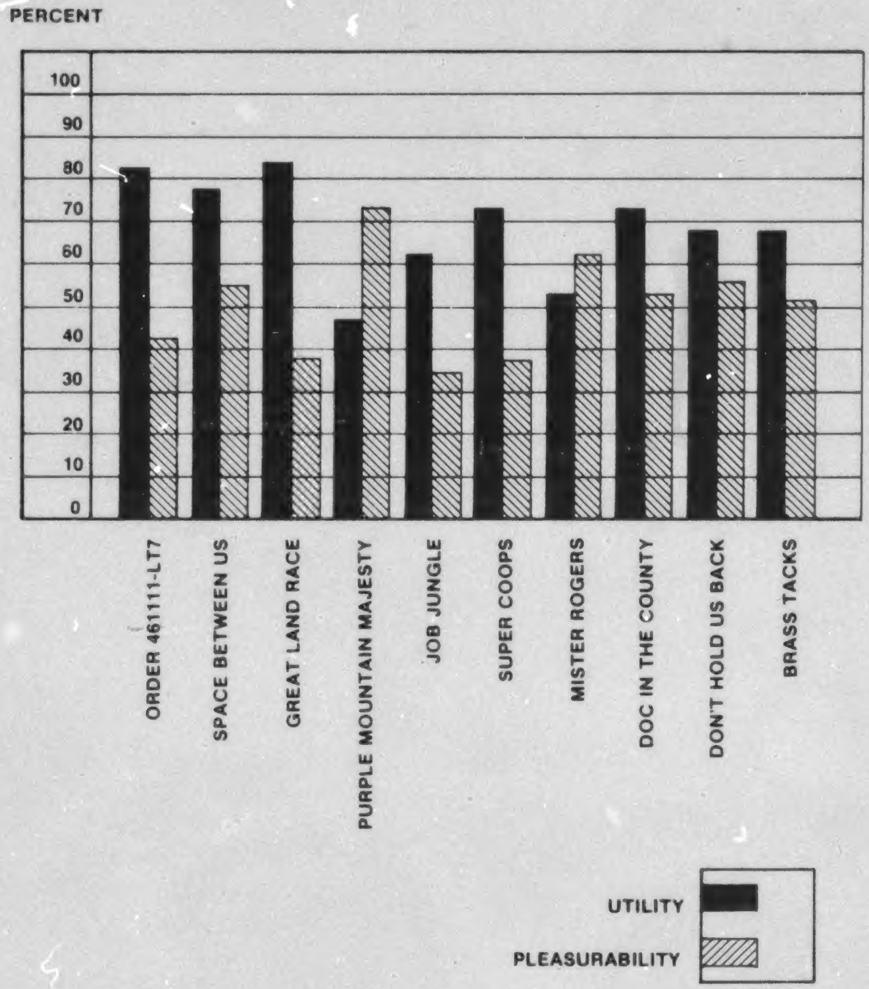


FIGURE 22

PERCENTAGE OF VIEWERS SELECTING RESPONSES INDICATING PLEASURABILITY AND UTILITY OF EACH EVENING PROGRAM

DISTANCE TRAVELED TO VIEW PROGRAMS

The second indicator of acceptance of individual programs is their ability to attract viewers. Attraction can be measured by the average number of miles traveled by audience members (Figure 23).

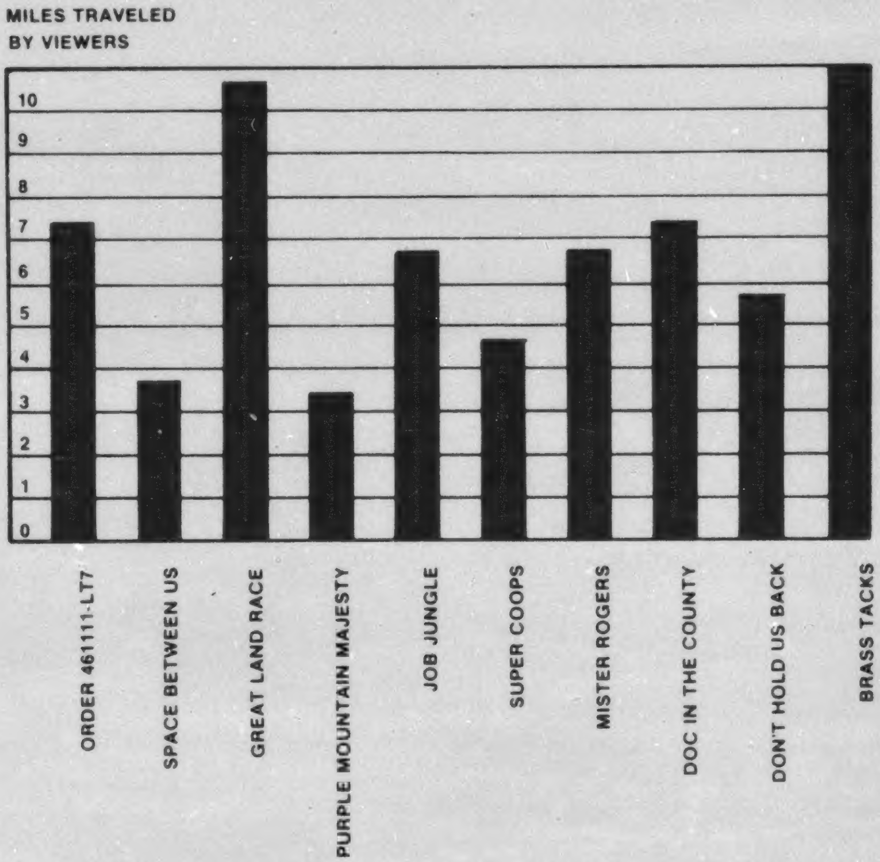


FIGURE 23

THE AVERAGE NUMBER OF MILES TRAVELED BY VIEWERS ATTENDING EACH EVENING PROGRAM AT INTENSIVE AND RECEIVE-ONLY SITES

"The Great Land Race" (about Western boom towns) and "Brass Tacks" (about the STD) attracted viewers from greater distances than did any other evening programs. These two programs featured appearances by persons from selected STD sites.

NUMBER OF VIEWERS ELECTING TO ATTEND

Another measure of attraction is the number of viewers who elect to attend. The attendance figures for each "Footprints" broadcast have been presented in Figure 24.

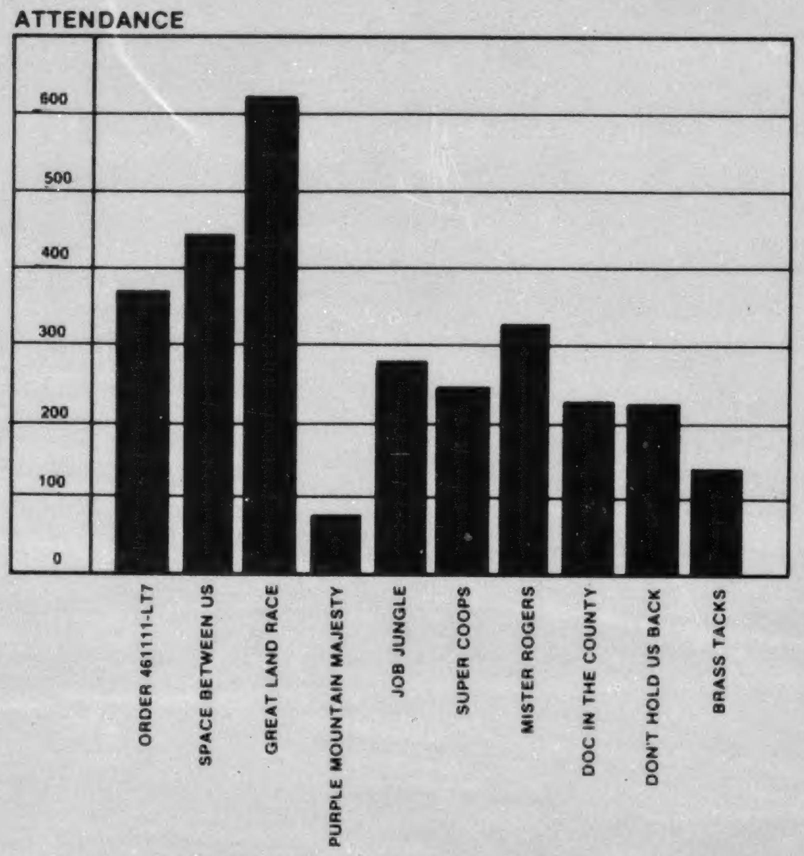


FIGURE 24
THE NUMBER OF VIEWERS ATTENDING EACH "FOOTPRINTS" BROADCAST AT INTENSIVE AND RECEIVE-ONLY SITES

"The Great Land Race" attracted over 600 viewers, the largest audience for any program. The program attracting the fewest number of viewers was "Of Purple Mountain Majesty," broadcast during the Christmas holidays.

FACTORS RELATED TO GENEREAL AUDIENCE ACCEPTANCE

To investigate factors related to general audience acceptance, selected items were cross-tabulated with the following: (1) type of site (Intensive or Receive-Only); (2) educational background; (3) sex; (4) ethnicity; (5) television viewing habits; (6) type of participation (taped or live); and (7) distance traveled to sites. These items dealt with three of the STD's products and services: the television program, accompanying audio interaction, and the STD site coordinator. In addition, cross-tabulations were performed on responses regarding continuance of the series. Data analysis results have been presented at the descriptive level only.

Type of Site. More general audience members at Intensive Sites considered both the television programs and the accompanying audio interaction to be pleasurable than did viewers at Receive-Only Sites. In terms of helpfulness, both groups gave similar responses. These findings indicate that those viewers capable of interacting enjoyed the programs more than did those who could not interact.

The percentage of audience members who perceived the presence of the site coordinator to be helpful was greater at IT Sites than at ROT Sites. (See Table 60.)

TABLE 60
The Percentage of Responses Selected by General Audience Members at Intensive and Receive-Only Sites

STD Products/ Evaluative Responses	Intensive		Receive Only	
	Percent	N	Percent	N
TV Programs		1,314		788
A Pleasure	53.7		48.1	
Helpful	73.6		73.6	
Of little worth	4.1		6.1	
A waste of time	1.0		0.8	
Audio Interaction		1,224		708
A Pleasure	53.0		41.0	
Helpful	67.4		66.2	
Of little worth	6.1		11.6	
A waste of time	0.7		1.1	
STD Site Coordinator		1,242		712
Very Helpful	53.8		45.9	
Helpful	41.2		44.7	
Somewhat Helpful	7.0		9.4	
Not Helpful	1.0		2.8	

When asked whether home viewing would be an improvement in the STD service: of the viewers at Intensive Sites, 44 percent replied "yes," and 24.5 percent replied "no"; whereas, at Receive-Only Sites, 56.5 percent replied "yes" and 17.6 percent said "no." Continuance of the series was desired by 85.6 percent of the viewers at Intensive Sites and by 80.7 percent of the audience at Receive-Only Sites. (This data has not been presented in tabular form.)

The demographic characteristics of viewers at Intensive and Receive-Only Sites have been presented in Tables 61 and 62.

TABLE 61
The General Audience Members at Intensive and Receive-Only Sites Categorized by Ethnicity and Sex

Characteristics	Intensive		Receive-Only	
	Percent	N	Percent	N
Ethnicity		1,146		712
Mexican American	4.4		5.1	
Native American	9.5		5.3	
Anglo	84.7		89.2	
Other	1.4		0.4	
Sex		1,214		753
Male	44.2		53.5	
Female	55.8		46.5	

TABLE 62
A Categorization of Viewers at Intensive and Receive-Only Sites by Average Numbers of Miles Traveled, Years of Schooling, and Hours of Television Viewed Per Day

	Intensive		Receive-Only	
	Mean	N	Mean	N
Miles Traveled	5.25	1,185	5.71	720
Years of Schooling	13.53	1,191	13.67	742
Hours of Television Per Day	2.20	1,172	2.20	750

Educational Background. To facilitate the cross tabulation for educational background, the years-of-schooling variable was categorized:

(1) grammar school: 1 through 7 years of schooling;
(2) high school: 8 through 12 years of schooling;
(3) college: 13 through 17 years of schooling; and
(4) graduate school: 17 years and up of schooling.

Relative to different educational backgrounds, the following percentages of viewers stated that the "Footprints" series should be continued:

(1) grammar school: 83.8 percent;
(2) high school: 87.7 percent;
(3) college: 84.8 percent; and
(4) graduate school: 77.1 percent.

A desire for series continuance was demonstrated by a larger percentage of viewers with a high school background than by viewers with any other level of educational experience. (These data have not been shown in tabular form.)

Analysis of the data revealed that as educational levels increased the number of viewers selecting a response which indicated that they perceived a product or service to be useful also increased. These data have been presented in Table 63.

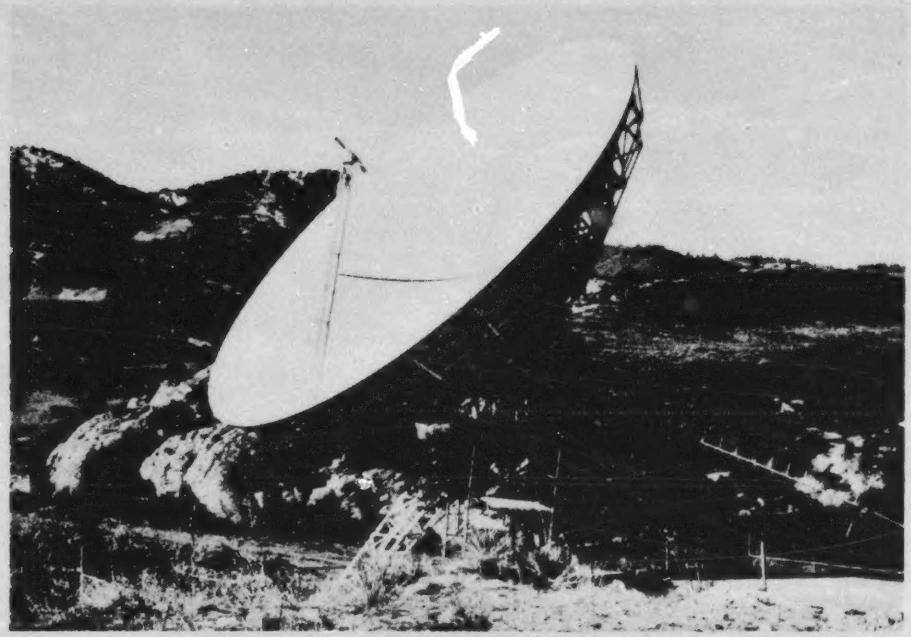
TABLE 63
The Percentage of Responses Selected by General Audience Members with Different Educational Backgrounds

STD Products/	Grammar School		High School		College		Graduate School	
Evaluative Responses	Percent	N	Percent	N	Percent	N	Percent	N
TV Program		172		608		702		406
A Pleasure	61.6		50.7		50.4		48.8	
Helpful	62.2		75.8		76.8		70.4	
Of little worth	2.9		3.8		5.3		5.7	
A waste of time	1.7		1.0		1.0		0.5	
Audio Interaction		159		569		649		362
A Pleasure	65.4		50.3		46.7		42.3	
Helpful	51.6		69.9		70.9		63.0	
Of little worth	8.2		6.0		7.4		11.0	
A waste of time	0.0		1.2		0.8		1.4	
Site Coordinator		170		577		651		358
Very Helpful	45.3		48.7		54.1		53.1	
Helpful	42.9		46.1		39.9		40.8	
Somewhat Helpful	10.6		7.1		8.0		6.4	
Not Helpful	3.5		1.2		1.7		2.2	

Sex. The differences between the responses of male and female viewers to the three STD products/services incorporated in the series have been presented in Table 64.

TABLE 64
The Percentage of Responses Selected by Male and Female General Audience Members

STD Products/ Evaluative Responses	Male		Female	
	Percent	N	Percent	N
TV Program		922		998
A Pleasure	52.0		50.6	
Helpful	71.6		75.6	
Of very little worth	5.0		5.1	
A waste of time	0.8		1.0	
Audio Interaction		836		922
A Pleasure	45.7		51.4	
Helpful	67.7		66.8	
Of very little worth	7.7		8.2	
A waste of time	1.2		0.5	
Site Coordinator		849		932
Very Helpful	51.4		51.4	
Helpful	41.3		42.6	
Somewhat Helpful	8.4		7.4	
Not Helpful	2.0		1.6	



Ethnicity. Among viewers with different ethnic and cultural backgrounds, differences were found in their perceptions of the helpfulness or pleasurability of the STD products and services. Of the Anglo and Mexican American viewers, a greater percentage of Anglos perceived the television program to be pleasurable; whereas a greater percentage of Mexican Americans perceived it to be helpful. (See Table 65.)

TABLE 65
The Percentage of Responses Selected by General Audience Members with Different Ethnic Cultural Backgrounds

STD Products/ Evaluative Responses	Mexican Americans		Native Americans		Anglo	
	Percent	N	Percent	N	Percent	N
TV Program		85		140		1,595
A Pleasure	41.2		50.0		52.3	
Helpful	78.8		72.9		74.3	
Of very little worth	4.7		5.7		4.6	
A Waste of Time	2.4		0.7		0.7	
Audio Interaction		81		132		1,444
A Pleasure	43.2		49.2		49.0	
Helpful	63.0		63.6		68.8	
Of very little worth	8.6		8.3		7.4	
A Waste of Time	1.2		0.0		0.9	
Site Coordinator		80		133		1,456
Very Helpful	62.5		42.9		52.2	
Helpful	30.0		43.6		42.4	
Somewhat Helpful	11.3		14.3		6.8	
Not Helpful	1.3		3.0		1.4	

In terms of their desire for series continuance, differences among the groups were not meaningful: 85.9 percent of the Mexican American audience, 84.5 percent of the Native American audience, and 83.9 percent of the Anglo audience wanted the series to continue. (This data has not been presented in tabular form.)

Television Viewing Habits. Relative to viewing habits and product and service acceptance, across groups a definite pattern of ratings was not evident. These data have been presented in Table 66.

TABLE 66
Percentage of Responses Selected by General Audience Members Viewing Different Numbers of Hours of Television During a Typical Day

STD Products/	Less than 1 Hour		1 Hour		2 Hours		3 Hours		4 Hours		5 or more Hours	
Evaluative Responses	%	N	%	N	%	N	%	N	%	N	%	N
TV Program		237		520		464		302		185		172
A Pleasure	43.5		52.5		51.7		52.6		54.6		48.3	
Helpful	80.2		73.3		74.4		75.8		68.1		71.5	
Of little worth	4.6		5.2		4.1		3.0		8.6		5.2	
A waste of time	0.8		0.6		1.1		1.3		0.0		2.3	
Audio Interaction		210		469		420		289		176		168
A Pleasure	45.7		48.2		46.0		56.7		46.0		48.2	
Helpful	71.0		66.7		67.4		65.1		69.9		64.3	
Of little worth	7.6		9.4		8.1		6.2		6.8		8.3	
A waste of time	1.0		1.1		1.0		1.4		0.0		1.2	
Site Coordinator		217		481		423		280		180		165
Very Helpful	51.6		54.7		50.8		46.1		52.8		51.5	
Helpful	41.0		39.5		46.3		46.1		37.2		39.4	
Somewhat Helpful	9.7		7.7		5.2		8.2		10.6		9.7	
Not Helpful	2.3		1.2		1.7		2.1		1.1		1.2	

The percentage of responses indicating a desire for continuation of the series ranged from a low of 80.06 percent for those audience members viewing 5 or more hours of television each day, to a high of 86.8 percent for those viewing 4 hours a day. The remaining groups responded as follows:

(1) viewing less than 1 hour: 86.2 percent;
(2) viewing 1 hour: 82.2 percent;
(3) viewing 2 hours: 84.6 percent; and
(4) viewing 3 hours: 84.3 percent.

Again, a definite pattern was not discernible. (This data has not been presented in tabular form.)

Type of Participation (Taped or Live). More viewers participating in programs broadcast "live" via satellite perceived the series and the three products/services to be helpful than did viewers of taped programs. (These data have been presented in Table 67.)

TABLE 67
Percentage of Responses Selected by General Audience Members Viewing Programs Either Taped or Live

STD Products/Responses	Live Percent	N	Taped Percent	N
TV Program		487		84
A Pleasure	55.9		57.1	
Helpful	70.8		57.1	
Of little worth	4.7		9.5	
A waste of time	1.4		2.4	
Audio Interaction		472		76
A Pleasure	53.2		50.0	
Helpful	66.7		53.9	
Of little worth	6.1		15.8	
A waste of time	0.8		1.3	
Site Coordinator		458		81
Very Helpful	54.6		43.2	
Helpful	37.8		45.7	
Somewhat helpful	7.6		13.6	
Not Helpful	1.1		1.2	

Viewers of both "live" and "taped" programs considered continuation of the series to be desirable: 80.6 percent and 81.0 percent, respectively. (This data has not been presented in tabular form.)

Distance Traveled To Sites. To facilitate the cross tabulation by distance traveled, the number of miles reported by viewers were categorized:

(1) less than 1 mile;
(2) 1 through 2 miles;
(3) 3 through 5 miles;
(4) 6 through 10 miles;
(5) 11 through 20 miles; and
(6) 21 or more miles.

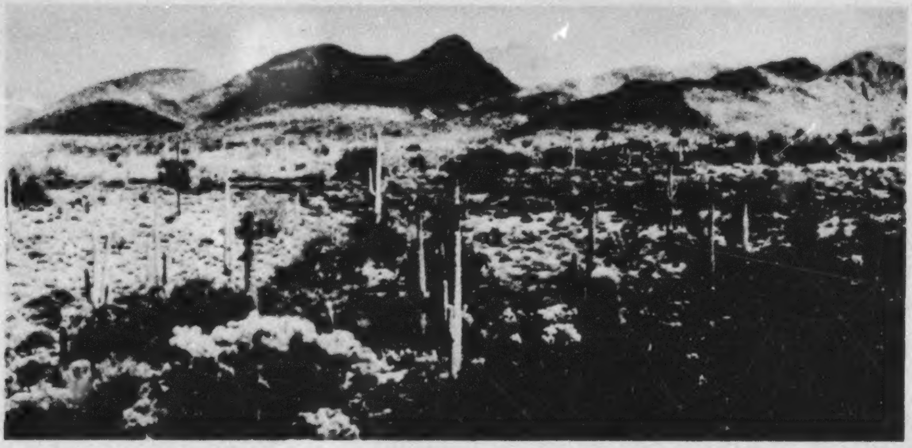
Reported percentages may have been distorted by the use of unequal categorization intervals.

Data relative to product and service acceptance and distance traveled to view the programs have been presented in Table 68.

TABLE 68
Percentage of Responses Selected by General Audience Members Traveling Different Numbers of Miles to Participate in STD Programs

STD Products/	Less than 1 Mile		1-2 Miles		3-5 Miles		5-10 Miles		10-20 Miles		21 or more Miles	
Evaluative Responses	%	N	%	N	%	N	%	N	%	N	%	N
TV Program		553		774		222		92		106		114
A Pleasure	47.6		51.4		57.7		54.3		62.3		40.4	
Helpful	83.7		71.2		68.0		62.0		68.9		80.7	
Of little worth	2.9		6.3		5.4		2.2		2.8		7.0	
A waste of time	0.2		0.6		1.4		1.1		0.2		0.9	
Audio Interaction		534		689		200		83		96		113
A Pleasure	49.4		47.0		53.0		57.8		59.4		37.2	
Helpful	69.3		66.9		64.0		53.0		65.6		72.2	
Of little worth	7.3		8.7		6.5		6.0		9.4		8.8	
A waste of time	0.7		0.7		1.5		0.0		1.0		0.9	
Site Coordinator		507		723		211		80		96		110
Very Helpful	49.1		53.7		53.1		55.0		62.5		44.5	
Helpful	46.2		39.8		42.7		45.0		37.5		41.8	
Somewhat Helpful	7.7		7.6		7.1		1.3		6.3		11.8	
Not Helpful	1.6		1.2		0.9		3.8		0.0		1.8	

Examination of the data in Table 68 revealed that helpfulness ratings decreased across groups as distance traveled increased (up to 10 miles). A sharp increase in helpfulness responses occurred for those viewers traveling from 10 to 21 miles or more.



For each distance category, the percentages of viewers indicating a desire for the continuation of the "Footprints" series have been presented in Table 69.

TABLE 69
The Percentage of Viewers Within Each Distance Category Indicating a Desire for Series Continuance

Miles Traveled	Percentage Indicating Yes	N
0 Miles	86.1	553
1-2 Miles	84.1	767
3-5 Miles	79.4	218
6-10 Miles	80.0	90
11-20 Miles	86.5	96
21 Miles or More	93.6	109

TECHNICAL DOCUMENTATION OF STUDENT LEARNING GAINS

FIRST SEMESTER TESTING

The purpose of the "Student Learning Gains Study" was to describe, analyze, and interpret data on student learning of and attitudes toward the career education concepts incorporated in STD student programming.

As previously described, the investigative effort was conducted on a two-semester basis: formative and summative.

During the first (formative) semester, pre- and post-testing occurred with those students at the STD's Intensive and Receive-Only Sites. To conserve resources, students at Open and Comparison Sites were not tested. The first semester results have been reported at the descriptive level only.

ANALYSIS SAMPLE

A total of 1,637 students participated in the satellite class during the first semester; 37.2 percent of whom (609) completed all pre- and post-test instruments. Missing data were due to absenteeism, transfers, and to midyear school schedules incongruent with the STD testing periods.

Two percentage change analyses were accomplished: one for the total population and one for the group of 609 students. The first analysis treated as an independent sample all students completing any one test. The second treated the group of 609 students as a dependent sample (referred to as "analysis sample"). A comparison of the resulting average change scores has been presented in Table 70.

TABLE 70
Differences Between the Average Percentage Change Scores on Each Test for the First Semester Total Population and Analysis Sample

Test	Total Population (Independent Sample)	Analysis Sample (Dependent Sample)	Differences
"Time Out" Test	6.2	7.0	+ 0.8
CMI Attitude Scale	6.0	5.1	- 0.9
CMI-Total	2.1	2.2	+ 0.1
CMI-Part I	1.1	0.9	- 0.2
CMI-Part II	1.7	1.6	- 0.1
CMI-Part III	3.6	4.4	+ 0.8

NOTE: All scores calculated using a 100-point scale.

As shown in Table 70, the differences between the total population and the analysis sample were both small and random. A systematic bias was not discernible.

DEMOGRAPHICS

An examination of the demographic data for both groups revealed that, in comparison with the total population, the analysis sample: (1) contained approximately eight percent more Anglos, two percent fewer Mexican Americans, and six percent fewer Native Americans; (2) had approximately the same percentage of males as females of the same average age; (3) was more evenly distributed across grades; and (4) had a slightly higher achievement level (i.e., a 0.20 grade level difference). These data have been reported for both the total population and the analysis sample in Table 71.

TABLE 71
Percentages for Sex, Grade, and Ethnic Categories for the First Semester Total Population and Analysis Sample

Characteristics	Samples			
	Total Population		Analysis Sample	
	N	Percent	N	Percent
Sex	1,474		609	
Male		53.5		48.8
Female		46.5		51.2
Grade	1,462		609	
Seventh		29.1		43.7
Eighth		51.8		37.7
Ninth		16.1		16.6
Tenth and Above		3.0		2.0
Ethnicity	1,441		591	
Mexican American		16.4		14.3
Native American		15.0		9.4
Anglo		67.9		76.1
Other		0.6		0.2

The total first semester population had an average age of 13.08 and an average achievement level of 6.94. The standard deviations were 1.05 and 2.08, respectively.

The analysis sample had an average age of 12.89 and an average achievement level of 7.14, respectively. The standard deviations were 1.00 and 1.91.

Because the differences between the two groups were small, the group of 609 students who completed all pre- and post-testing was used as the sample for all first semester data analyses.

KNOWLEDGE GAINS AND ATTITUDE CHANGES

Using the analysis sample of 609 first semester students, the STD staff computed the percentage of pre-post change in student performance on each of the following knowledge and attitude measures:

1. The criterion-referenced **"Time Out" Test**.
2. The **Attitude Scale** of the **Career Maturity Inventory** (referred to as the **CMI Attitude Scale**).
3. The following three sections of the **Competence Test** of the **Career Maturity Inventory** (referred to as the **CMI**):

   Part I: Knowing about jobs (career awareness)

   Part II: Choosing a job (self-assessment)

   Part III: What should they do? (decision-making)

The first semester students demonstrated positive changes in knowledge and attitudes on all measures. The largest change (an average gain of 7.0 percent) occurred on the criterion-referenced **"Time Out" Test**. This gain was significant in that these values were based on all 350 items, not on the 64 items selected for the second semester version of the test.

On the various parts of the **Career Maturity Inventory** (**CMI**), first semester students demonstrated the following average gains:

CMI Attitude Scale	5.1 percent
CMI-Total	2.2 percent
CMI-Part I	0.9 percent
CMI-Part II	1.6 percent
CMI-Part III	4.4 percent

It should be noted that the **CMI** was not specifically designed to measure the learning outcomes of the STD student J-Series as was the **"Time Out" Test**. Rather, this instrument is a nationally standardized test designed to measure the "Domain of Career Education" as defined by its author, John Crites. Part I of the test purports to measure career (job) awareness; however, the 20 jobs selected for inclusion in this part of the instrument were not the same as those chosen for inclusion in the student J-Series. Such discrepancies as this could have resulted in the differences between the students' performance on the **CMI** and their performance on the criterion-referenced **"Time Out" Test**. All data regarding the average gains of first semester students have been presented in Table 72.

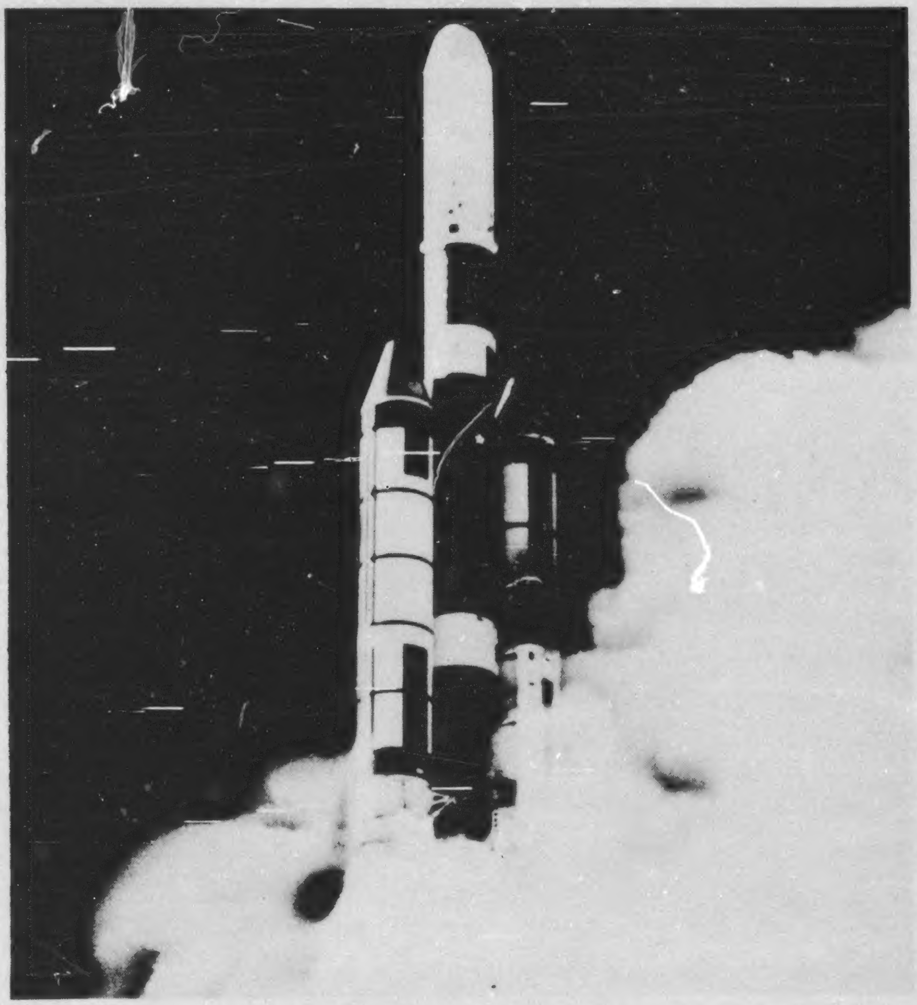
Education Via Satellite
MARTIN MARIETTA

TABLE 72

Percentage of Change in Knowledge and Attitude Scores for Combined First Semester Students at Intensive and Receive-Only Sites

Tests	Average Percent Correct Pre-Test	N	Average Percent Correct Post-Test	N	Average Percent Change	N	Number of Test Items
"Time Out" Test	59.7	513	65.0	440	7.0	440	27*
CMI Attitude Scale	61.0	608	66.1	609	5.1	608	50
CMI—Total	48.1	609	50.5	603	2.2	603	60
CMI—Part I	59.4	602	60.4	602	0.9	602	20
CMI—Part II	50.3	609	51.7	599	1.6	599	20
CMI—Part III	34.7	607	39.0	597	4.4	595	20

*27 per student, 350 across all students.



A better understanding of student gains in knowledge is obtained by comparing their performance on the **CMI** with the performance of a national sample of junior high students on the same test (Crites, John O. **Administration and Use Manual** [**CMI**]. Monterey, California: CTB/McGraw-Hill, Inc., 1973). On the pre-test, the STD students scored above the national average on only one of the five **CMI** sections (**CMI**-Part I). After completing the STD class, the same students scored above the national average on four out of five sections: **CMI Attitude Scale; CMI**-Total; **CMI**-Part I; and **CMI**-Part III. On the **CMI**-Part I, where they were already five points above the national average, they had a pre-post gain of 0.92 points. On the **CMI**-Part II, they gained to a point very near the national average but did not surpass it. (The raw scores for the national sample presented in the **Administration and Use Manual** were converted to percentages in order to compare the data.) These data have been presented in Table 73.

TABLE 73
Percentage Correct by Both First Semester Students and a National Sample on the Career Maturity Inventory

	Intensive and Receive-Only Students		National Sample
Tests	Pre-Test Average Percent Correct	Post-Test Average Percent Correct	Average Percent Correct
CMI Attitude Scale	61.0	65.0	64.2
CMI—Total	48.1	50.5	48.7
CMI—Part I	59.4	60.4	54.5
CMI—Part II	50.3	51.9	52.3
CMI—Part III	34.7	39.0	35.4

The reader should recognize that, since comparison groups were absent during the first semester effort, any results could be due to maturation or non-STD experiences. However, the comparison between the scores of students at Intensive and Receive-Only Sites with those of the national sample would indicate that the STD programming had a positive effect on students' career-related knowledge and attitudes.

SECOND SEMESTER TESTING

Second semester testing was conducted with students at four kinds of sites: Intensive, Receive-Only, Open, and Comparison. Summative testing occurred within a pre- and post-test design. Analyses of the data were performed at descriptive and comparative levels.

DEMOGRAPHICS

The second semester student population contained: (1) a larger percentage of Anglos (72.72 percent); (2) a slightly unequal distribution of males (50.72 percent) and females (49.28 percent); and (3) an unequal grade distribution, with over 50 percent of the students being in the eighth grade. The total population had an average age of 13.49 and an average achievement level of 7.33. The data relative to the sex, grade, and ethnicity have been presented in Table 74.

TABLE 74

Percentages for Sex, Grade, and Ethnic Categories for all Second Semester Students and for Students at Each Type of Site

	Intensive		Receive-Only		Open		Comparison		All	
Characteristic	Percent	N	Percent	N	Percent	N	Percent	N	Percent	N
Sex		610		858		342		114		2005
Male	50.00		52.21		47.95		49.12		50.72	
Female	50.00		47.79		52.05		50.88		49.28	
Grade		617		828		341		112		1968
Seventh	30.96		22.71		30.79		13.39		26.98	
Eighth	34.85		66.79		48.39		72.32		53.46	
Ninth	32.09		9.90		12.90		14.29		17.28	
Tenth and above	2.10		.60		7.92				2.28	
Ethnicity		599		852		339		47		1969
Mexican Amer.	10.68		17.61		22.12		4.26		15.13	
Native Amer.	25.38		4.34		2.95		4.26		10.67	
Anglo	61.77		77.11		74.34		85.11		72.73	
Other	2.17		.94		.58		6.39		1.47	

KNOWLEDGE GAINS

Career-related knowledge was assessed through the administration of the previously described **"Time Out" Test** and three major sections of the **Career Maturity Inventory**. The purposes of this effort were to describe independently the percentage of change in student knowledge scores and to identify factors affecting the knowledge gains of students at both Intensive and Receive-Only Sites (hereafter referred to as STD students).

Percentage of change was calculated on the basis of the total number of items attempted by respondents, and therefore, does not reflect data omissions. The analyses for identifying factors which affected knowledge gains were performed on raw gain scores and, therefore, do reflect data omissions (i.e., students skipping items or test sections). Due to these different approaches, disparities appear between the average scores utilized for each process.

Knowledge Gains of STD Students (IT and ROT)

During the second semester, the 1,478 STD students demonstrated positive changes in career-related knowledge.

An average change of 10.4 percent occurred on the criterion-referenced "**Time Out**" **Test**, indicating that the STD programming enhanced student acquisition of those behaviors described in the learning objectives. The scores generated by the **"Time Out" Test** had the following odd-even reliability coefficients, as corrected by the Spearman-Brown Formula: Pre-test = 0.84; post-test = 0.91; gain scores = 0.76.

On the various parts of the **Career Maturity Inventory (CMI)**, second semester students recorded the following average gains:

CMI-Total	3.3 percent
CMI-Part I	2.0 percent
CMI-Part II	3.0 percent
CMI-Part III	5.1 percent

As previously stated, the **CMI** was not specifically designed to measure the learning outcomes of the STD student J-Series. Therefore, differences appeared between the students' performance on the **CMI** and their performance on the criterion-referenced **"Time Out" Test**. Student performance on the major sections of the **CMI** indicates that some degree of career-related knowledge was acquired within all three major areas of the STD curriculum as defined by the test's author, John Crites. The largest average gain (5.1 percent) occurred in the area of decision-making. All data on second semester student gains in knowledge have been presented in Table 75.

TABLE 75
Percentage of Change in Knowledge Scores Demonstrated by Combined Second Semester Students at Intensive and Receive-Only Sites

Tests	Average Percent Correct Pre-Test	N	Average Percent Correct Post-Test	N	Average Percent Change	N	Numbers of Test Items
"Time Out" Test	62.7	1,223	72.6	1,048	10.4	882	64
CMI—Total	48.6	1,220	50.2	1,265	3.3	988	60
CMI—Part I	58.7	1,220	59.1	1,262	2.0	986	20
CMI—Part II	49.9	1,208	51.5	1,260	3.0	975	20
CMI—Part III	36.7	1,198	40.0	1,252	5.1	963	20

Knowledge Gains of Non-STD Students (Open and Comparison)

Open Site Students. During the second semester, 13 schools which received the student J-Series via local PTV stations served as research sites. A total of 242 Open Site students demonstrated positive changes in knowledge. However, these gains cannot be compared with those of the STD students. The primary difference between Open Sites and STD sites was the unavailability of the interactive "Time In" program for viewing by Open Site students. The STD students were able to watch and/or participate in the career education discussions which were a major part of the "Time In" series.

The Open Site students demonstrated an average gain of 7.5 percent on the criterion-referenced **"Time Out" Test**. This average gain indicates that the STD achieved some of its learning objectives with the Open Site students.

Similar results occurred on the **CMI**. The Open Site students demonstrated the following average gains:

CMI-Total	3.1 percent
CMI-Part I	1.8 percent
CMI-Part II	1.6 percent
CMI-Part III	2.9 percent

All data on the average knowledge gains of Open Site students have been presented in Table 76.

TABLE 76
Percentage of Change in Knowledge Scores Demonstrated by Students at Open Sites

Tests	Percent Correct Pre-Test	N	Percent Correct Post-Test	N	Percent Change	N
"Time Out" Test	62.4	301	71.3	218	7.5	195
CMI—Total	48.8	310	52.3	228	3.1	209
CMI—Part I	59.3	310	61.5	228	1.8	209
CMI—Part II	50.2	309	52.2	224	1.6	206
CMI—Part III	37.1	308	38.2	197	2.9	180

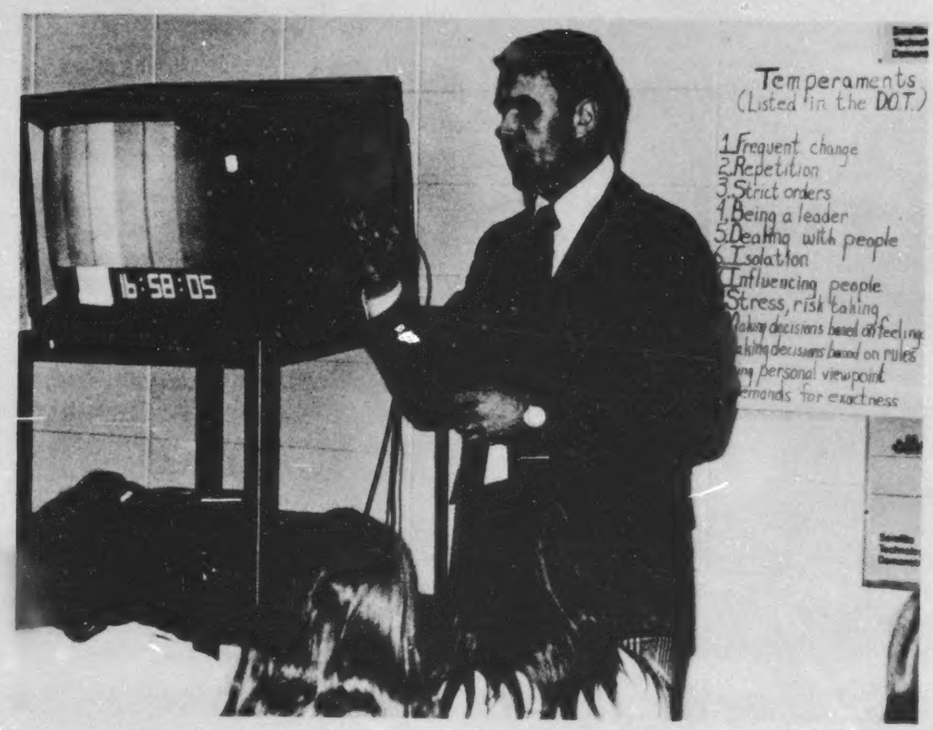
Comparison Site Students. During the second semester, six schools which did not receive any STD products and services served as Comparison Sites. A total of 128 Comparison Site students demonstrated no positive gains in knowledge. Instead the following negative changes resulted:

"Time Out" Test	- 0.1 percent
CMI-Total	- 2.6 percent
CMI-Part I	- 3.3 percent
CMI-Part II	- 3.1 percent
CMI-Part III	- 0.3 percent

These data have been presented in Table 77.

TABLE 77
Percentage of Change in Knowledge Scores Demonstrated by Second Semester Students at Comparison Sites

Tests	Percent Correct Pre-Test	N	Percent Correct Post-Test	N	Percent Change	N
"Time Out" Test	59.7	131	61.7	117	- 0.1	113
CMI—Total	48.0	126	46.0	111	- 2.6	102
CMI—Part I	57.6	126	55.6	111	- 3.3	102
CMI—Part II	49.8	123	46.9	111	- 3.1	102
CMI—Part III	34.7	116	35.2	110	- 0.3	98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Temperaments
(Listed in the D.O.T.)
1. Frequent change
2. Repetition
3. Strict orders
4. Being a leader
5. Dealing with people
6. Isolation
7. Influencing people
Stress, risk taking
Making decisions based on feelings
Making decisions based on rules
personal viewpoint
demands for exactness

FACTORS RELATED TO KNOWLEDGE GAINS

To investigate factors affecting second semester changes in knowledge and thereby to test the null hypotheses stated in the "Evaluation Plan," gain scores were examined using either one-way analysis of variance or t-tests. The following factors were used: (1) type of site; (2) age; (3) sex; (4) grade; (5) ethnicity; (6) grade-equivalent achievement level; (7) Locus of Control; (8) teacher acceptance; and (9) student acceptance.

Type of Site. Significant differences were found among the knowledge gain scores of students at different types of sites (Intensive, Receive-Only, Open, and Comparison). Analyses of the data revealed four F-ratios ranging from 5.31 to 14.76, all of which were found to be significant. These data have been presented in Table 78.

TABLE 78

The Degrees of Freedom, Sums of Squares, and F-Ratios for the Knowledge Gain Scores of Students at Different Types of Sites

Tests	Degrees of Freedom	Sums of Squares	F-Ratios
"Time Out" Test	3		
Between Groups	3	1,510.85	
Within Groups	1,186	112,475.80	5.31*
CMI—Total			
Between Groups	3	2,587.33	
Within Groups	1,295	75,655.59	14.76*
CMI—Part I			
Between Groups	3	176.62	
Within Groups	1,293	16,086.08	4.73*
CMI—Part II			
Between Groups	3	193.38	
Within Groups	1,279	14,668.06	5.62*
CMI—Part III			
Between Groups	3	185.21	
Within Groups	1,241	12,446.58	6.14*

*P less than .05

Since unequal N's occurred among the groups, Bartlett statistics were calculated to test the homogeneity of variance assumption underlying the F-tests. These analyses resulted in four Bartlett Chi-square values ranging from 5.19 to 15.20, only one of which was found to be significant. Due to violations of the homogeneity of variance assumption, the significant F-ratio for the knowledge gains on the **CMI**-Part II must be accepted with caution. The F-ratios for all other knowledge measures can be accepted as indicating significant differences. These data have been presented in Table 79.

TABLE 79
The N's, Variances, and the Bartlett Chi-square Values for the Knowledge Gain Scores of Students at Different Types of Sites

Tests and Groups	N	Variance	Bartlett Chi-square
"Time Out" Test			
Intensive	364	95.28	
Receive-Only	518	103.78	
Open	195	80.78	
Comparison	113	76.51	6.97
CMI—Total			
Intensive	398	53.09	
Receive-Only	590	64.46	
Open	209	50.11	
Comparison	102	61.45	7.23
CMI—Part I			
Intensive	396	11.66	
Receive-Only	590	13.73	
Open	209	10.59	
Comparison	102	11.79	6.70
CMI—Part II			
Intensive	389	9.47	
Receive-Only	586	13.05	
Open	206	9.82	
Comparison	102	13.38	15.20*
CMI—Part III			
Intensive	386	8.90	
Receive-Only	577	10.43	
Open	180	10.24	
Comparison	98	12.15	5.19

*P less than .05

NOTE: DF = 3

An examination of the cell means (Table 80) revealed that the largest average gains were made by the Intensive Site students, and the smallest average gains occurred for the Comparison Site students. The second-largest average gains occurred for either the Receive-Only Site students or the Open Site students. These results indicate that the STD student programming had a positive effect on the knowledge gains of students.

TABLE 80
The Cell Means for the Analyses of Variance Performed on the Knowledge Gains of Students at Different Types of Sites

	Type of Site			
Tests	**Intensive**	**Receive-Only**	**Open**	**Comparison**
"Time Out" Test	7.16	6.06	6.20	2.98
CMI—Total	3.11	1.32	- 0.55	- 1.09
CMI—Part I	0.73	0.18	0.34	- 0.67
CMI—Part II	0.91	0.34	0.29	- 0.53
CMI—Part III	1.30	0.78	0.44	- 0.03

The data presented in Table 80 also indicate that the ability to participate in audio interaction was related to higher knowledge gains. This conclusion was supported not only by the consistently good performance of the Intensive Site students but also by the occasional reversals in the means of the Receive-Only and Open Site students. ROT students received all programs directly via satellite, viewed the interactive segments, but were unable to participate directly in audio interaction via the ATS-3. Open Site students received all "Time Out" broadcasts via local PTV stations but could not view the interactive segments.

Age. One significant difference was found among the knowledge gain scores of students of different ages (12, 13, 14, and 15 year olds). Analysis of the data revealed four F-ratios ranging from 0.31 to 7.05. The F-ratio of 7.05 for the **"Time Out" Test** was found to be significant. Since unequal N's occurred among the groups used in this F-test, a Bartlett statistic was calculated to test the homogeneity of variance assumption. This Chi-square value of 1.39 was found to be non-significant; therefore, the F-ratio for the **"Time Out" Test** can be accepted as indicating significant differences. These data have been presented in Table 81.

TABLE 81
The Degrees of Freedom, Sums of Squares, and F-Ratios for the Knowledge Gains of Students in Different Age Groups at Intensive and Receive-Only Sites

Tests	Degrees of Freedom	Sums of Squares	F-Ratios
"Time Out" Test			
Between Groups	3	1,922.65	
Within Groups	1,168	106,220.90	7.05*
CMI—Total			
Between Groups	3	197.05	
Within Groups	1,277	76,825.10	1.09
CMI—Part I			
Between Groups	3	11.78	
Within Groups	1,275	15,946.98	0.31
CMI—Part II			
Between Groups	3	17.68	
Within Groups	1,261	14,525.21	0.51
CMI—Part III			
Between Groups	3	9.72	
Within Groups	1,220	12,466.84	0.32

* P less than .05

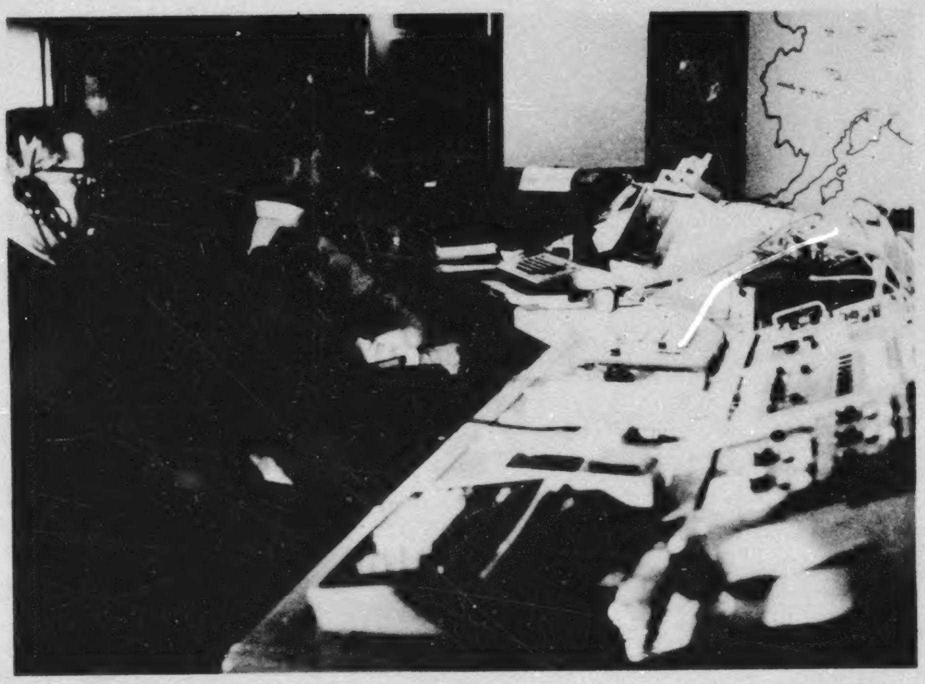
NOTE: A Bartlett Chi-square value of 1.39 was found to be non-significant at the .05 level.

An examination of the cell means (Table 82) revealed that 14 year old students achieved the largest average gains (7.24). The smallest average gain (3.34) occurred for the 15 year old students. The average gain scores for the 12 and 13 year old students were 6.32 and 6.77, respectively. These results indicate that the STD student programming was most relevant for its intended audience.

TABLE 82

The Cell Means for the Analysis of Variance Test Performed on the "Time Out" Test Gain Scores of Students in Different Age Groups at Intensive and Receive-Only Sites

Age Groups	Mean	N
12	6.32	188
13	6.77	490
14	7.24	319
15	3.34	175



Sex. The significance of the differences between the knowledge gain scores of males and females was investigated via the t-test. Analysis of the data revealed five t-values ranging from 0.64 to 2.55. Three of these were found to be significant: the **CMI**-Total, the **CMI**-Part II, and the **CMI**-Part III. An examination of the means revealed that, on each of these three knowledge measures, the female students achieved larger gains than did the male students. These data have been presented in Table 83.

The items comprising the **CMI** were chosen for their lack of discrimination between males and females. The significant differences depicted in Table 83 occurred because the STD students were somewhat different from those students on whose data the selection of the **CMI** test items was based. Also, the STD attempted to eliminate sex stereotyping in occupations.

TABLE 83

The Standard Deviations, N's, and t-Values for the Knowledge Gain Scores of Males and Females at Intensive and Receive-Only Sites

Tests/Sex Groups	Mean	Standard Deviations	N	t-Values
"Time Out" Test				
Males	5.93	9.64	604	
Females	6.75	9.53	571	1.46
CMI—Total				
Males	0.93	7.79	653	
Females	1.97	7.68	631	2.40*
CMI—Part I				
Males	0.21	3.64	651	
Females	0.40	3.43	631	0.64
CMI—Part II				
Males	0.27	3.39	647	
Females	0.68	3.38	621	2.16*
CMI—Part III				
Males	0.61	3.16	629	
Females	1.08	3.22	597	2.55*

* P less than .05

Grade. The analysis of variance techniques applied to the knowledge gain scores of students at different grade levels revealed five F-ratios from 0.11 to 8.82. A statistically significant difference was found among the **"Time Out" Test** gain scores of students in the 7th, 8th, 9th, and 10th grades. Since unequal N's occurred among the groups, a Bartlett statistic was calculated to test the homogeneity of variance assumption. The resulting Bartlett Chi-square value of 23.75 was found to be significant; therefore, the significant F-ratio must be accepted with caution. These data have been presented in Table 84.

TABLE 84

The Degrees of Freedom, Sums of Squares, and F-Ratios for the Knowledge Gain Scores of Students at Different Grade Levels at Intensive and Receive-Only Sites

Test	Degrees of Freedom	Sums of Squares	F-Ratio
"Time Out" Test			
Between Groups	3	2,380.19	
Within Groups	1,143	102,838.90	8.82*
CMI—Total			
Between Groups	3	19.67	
Within Groups	1,246	76,164.68	0.11
CMI—Part I			
Between Groups	3	45.17	
Within Groups	1,244	15,625.34	1.20
CMI—Part II			
Between Groups	3	65.87	
Within Groups	1,230	14,114.99	1.91
CMI—Part III			
Between Groups	3	39.49	
Within Groups	1,189	12,181.84	1.29

* P less than .05

NOTE: A Bartlett Chi-square value of 23.75 was found to be significant at the .05 level.

An examination of the cell means (Table 85) revealed that the differences among the 7th, 8th, and 9th grade students were slight. These results indicate that the STD student programming had a positive effect on the career-related learning of its intended audience.

TABLE 85

The Cell Means for the Analysis of Variance Performed in the "Time Out" Test Gain Scores of Intensive and Receive-Only Site Students at Different Grade Levels

Grade Level Groups	Mean	N
7th	6.02	329
8th	6.76	606
9th	7.09	183
10th	- 2.24	29

Ethnicity. The analysis of variance techniques applied to the knowledge gain scores of students with different ethnic backgrounds (Anglo, Native American, Mexican American) revealed five F-ratios ranging from 0.19 to 12.45. A statistically significant difference was found on the **"Time Out" Test** gain scores. Since unequal N's occurred among the groups, a Bartlett statistic was calculated to test the homogeneity of variance assumption. The resulting Chi-square value of 2.71 was found to be non-significant at the .05 level. Therefore, this F-ratio can be accepted as indicating significant differences. (See Table 86.)

TABLE 86

The Degrees of Freedom, Sums of Squares, and F-Ratios for the Knowledge Gain Scores of Students with Different Ethnic Backgrounds at Intensive and Receive-Only Sites

Tests	Degrees of Freedom	Sums of Squares	F-Ratios
"Time Out" Test			
Between Groups	2	2,246.29	
Within Groups	1,152	103,917.50	12.45*
CMI—Total			
Between Groups	2	102.69	
Within Groups	1,262	75,896.50	0.85
CMI—Part I			
Between Groups	2	4.82	
Within Groups	1,260	15,732.56	0.19
CMI—Part II			
Between Groups	2	19.13	
Within Groups	1,246	14,359.94	0.83
CMI—Part III			
Between Groups	2	7.57	
Within Groups	1,204	12,273.77	0.37

* P less than .05

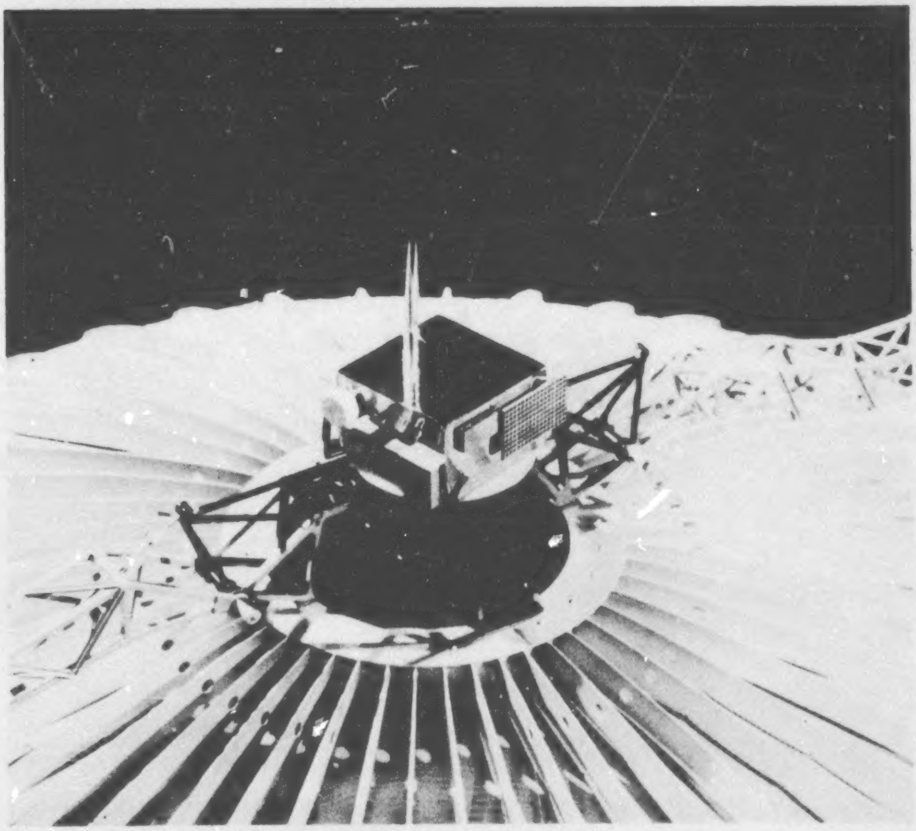
NOTE: A Bartlett Chi-square value of 2.71 was found to be non-significant at the .05 level.

An examination of the cell means (Table 87) revealed that Mexican American students achieved larger gains than did either the Anglo or Native American students. The average gain of the Mexican American students was 9.81. Those of the Native American and the Anglos were 4.58 and 6.00, respectively. The percentage (13.7 percent) of Mexican American students in the STD population who completed the **"Time Out" Test** was the same as the percentage (14 percent) of Mexican Americans residing in the Rocky Mountain region. Also notable is the small difference occurring between the gain scores of Anglo students and Native American students.

TABLE 87

The Cell Means for the Analysis of Variance Performed on the "Time Out" Test Gain Scores of Students with Different Ethnic Backgrounds at Intensive and Receive-Only Sites

Ethnic Groups	Mean	N
Anglo	6.00	918
Mexican American	9.81	158
Native American	4.58	79



Grade-Equivalent Achievement Level. Significant differences were found among the knowledge gain scores of students with different grade-equivalent achievement levels (4th and below, 5th, 6th, 7th, 8th, 9th, 10th and above). Analysis of the data revealed five F-ratios ranging from 1.16 to 3.64. Significant F-ratios occurred for the **CMI**-Total, the **CMI**-Part I, and the **CMI**-Part II. These data have been presented in Table 88.

TABLE 88
The Degrees of Freedom, Sums of Squares, and F-Ratios for the Knowledge Gain Scores of Students With Different Achievement Levels at Intensive and Receive-Only Sites

Test	Degrees of Freedom	Sums of Squares	F-Ratios
"Time Out" Test			
Between Groups	6	1,068.89	
Within Groups	875	74,849.89	2.08
CMI—Total			
Between Groups	6	1,119.24	
Within Groups	954	52,240.48	3.41*
CMI—Part I			
Between Groups	6	202.02	
Within Groups	952	11,504.82	2.79*
CMI—Part II			
Between Groups	6	242.18	
Within Groups	943	10,451.88	3.64*
CMI—Part III			
Between Groups	6	69.41	
Within Groups	935	93,478.62	1.16

* P less than .05

Since unequal N's occurred among the groups, Bartlett statistics were calculated to test the homogeneity of variance assumption. This analysis revealed three Bartlett Chi-square values ranging from 9.61 to 36.16. The two Chi-square values for the **CMI**-Total and the **CMI**-Part I were found to be significant. Therefore, the significant F-ratios for these two sections of the **CMI** must be accepted with caution. The F-ratio for the **CMI**-Part II can be accepted as indicating significant differences. These data have been presented in Table 89.

TABLE 89

The N's, Variances, and Bartlett Chi-square Values for the CMI Knowledge Gain Scores of Intensive and Receive-Only Site Students with Different Achievement Levels

Tests/Achievement Groups	N	Variance	Bartlett Chi-Square Values
CMI—Total			
Fourth and Below	89	50.18	
Fifth	95	46.69	
Sixth	149	71.18	
Seventh	180	56.49	
Eighth	163	60.40	
Ninth	128	50.84	
Tenth and Above	157	41.98	13.31*
CMI—Part I			
Fourth and Below	89	14.65	
Fifth	95	12.02	
Sixth	149	16.70	
Seventh	179	11.38	
Eighth	163	13.79	
Ninth	128	10.42	
Tenth and Above	156	6.66	36.16*
CMI—Part II			
Fourth and Below	88	9.89	
Fifth	93	13.47	
Sixth	146	11.19	
Seventh	176	11.20	
Eighth	163	12.57	
Ninth	128	11.38	
Tenth and Above	156	8.31	9.61

* P less than .05

NOTE: DF = 6

An examination of the cell means (Table 90) revealed that the largest average gains occurred for those students achieving at the 10th grade level and above, and the lowest average gains occurred for those students achieving at the 4th grade level and below. On the **CMI**-Part I, the lowest average gain occurred for those students achieving at the 6th grade level.

TABLE 90

The Cell Means for the Analysis of Variance Performed on the CMI Knowledge Gain Scores of Students With Different Achievement Levels at Intensive and Receive-Only Sites

Tests/Achievement Groups	Mean	N
CMI—Total		
Fourth and Below	- 0.20	89
Fifth	1.33	95
Sixth	0.68	149
Seventh	1.18	180
Eighth	1.20	163
Ninth	1.81	128
Tenth and Above	3.63	157
CMI—Part I		
Fourth and Below	0.15	89
Fifth	0.50	95
Sixth	- 0.38	149
Seventh	0.05	179
Eighth	0.13	163
Ninth	0.14	128
Tenth and Above	1.15	156
CMI—Part II		
Fourth and Below	- 0.72	88
Fifth	0.25	93
Sixth	0.45	146
Seventh	0.47	176
Eighth	0.23	163
Ninth	0.73	128
Tenth and Above	1.26	156

The lack of a significant difference on the **"Time Out" Test** gain scores was meaningful. A great effort was made by the STD staff to ensure that this test contained few words above the 4th or 5th grade reading level to ensure that the test measured knowledge and not reading ability. The exception to this procedure was the career-related vocabulary presented within the student series itself. In light of this fact, it would appear that the STD student programming was relevant for both low and high achievers, especially in the accomplishment of the STD learning objectives. Support for this conclusion is found in the lack of a significant difference in the **CMI**-Part III, as well as in the possibility that the significant differences found on the **CMI**-Total and **CMI**-Part I were due to a violation of the assumption of homogeneous variances.

Locus of Control. Statistically significant differences were found among the knowledge gain scores of students with different Loci of Control. Analysis of the data revealed five F-ratios ranging from 7.92 to 15.38, all of which were significant. These data have been presented in Table 91.

TABLE 91
The Degrees of Freedom, Sums of Squares, and F-Ratios for the Knowledge Gain Scores of Students with Different Loci of Control at Intensive and Receive-Only Sites

Tests	Degrees of Freedom	Sums of Squares	F-Ratio
"Time Out" Test			
Between Groups	3	2,987.54	
Within Groups	1,184	110,885.70	10.63*
CMI—Total			
Between Groups	3	2,633.36	
Within Groups	1,293	73,796.63	15.38*
CMI—Part I			
Between Groups	3	367.91	
Within Groups	1,292	15,660.39	10.12*
CMI—Part II			
Between Groups	3	313.48	
Within Groups	1,277	14,363.52	9.29*
CMI—Part III			
Between Groups	3	235.75	
Within Groups	1,235	12,255.25	7.92*

* P less than .05

Since unequal N's occurred among the groups, Bartlett Chi-square statistics were calculated to test the homogeneity of variance assumption. This analysis resulted in five Bartlett Chi-square values ranging from 0.68 to 27.89. The only Chi-square value found to be non-significant occurred for the **CMI**-Part III. Therefore, this F-ratio can be accepted as indicating significant differences. All of the other significant F-ratios must be accepted with caution. These data have been presented in Table 92.

TABLE 92
The N's, Variances, and Bartlett Chi-square Values for the Knowledge Scores of Students With Different Loci of Control

Test/Locus of Control Groups by Quartiles	N	Variance	Bartlett Chi-Square Values
"Time Out" Test			
First Quartile (lowest)	295	109.31	
Second Quartile	312	74.79	
Third Quartile	271	102.39	
Fourth Quartile (highest)	310	98.12	12.22*
CMI—Total			
First Quartile	265	73.89	
Second Quartile	365	54.11	
Third Quartile	312	50.95	
Fourth Quartile	354	52.96	12.84*
CMI—Part I			
First Quartile	264	17.26	
Second Quartile	366	11.44	
Third Quartile	312	11.30	
Fourth Quartile	354	9.72	27.89*
CMI—Part II			
First Quartile	261	14.73	
Second Quartile	362	10.89	
Third Quartile	308	10.46	
Fourth Quartile	350	9.73	14.81*
CMI—Part III			
First Quartile	251	10.48	
Second Quartile	350	9.70	
Third Quartile	304	10.09	
Fourth Quartile	334	9.59	0.68

* P less than .05

NOTE: DF = 3

An examination of the cell means (Table 93) revealed that, on all parts of the **CMI**, the largest average gains occurred for those students most motivated by something within themselves. The levels of Locus of Control were established by grouping students into quartiles on the basis of their scores on the **Bialer-Cromwell Locus of Control Scale** (first quartile = low, fourth = high). On the **"Time Out" Test** the largest average gain occurred for those students in the third quartile, i.e., the second highest in self-motivation (something within themselves). The levels of Locus of Control were established by grouping students into quartiles on the basis of their environment (first quartile).

TABLE 93
The Cell Means for the Analyses of Variance Performed on the Knowledge Gain Scores of Students with Different Loci of Control at Intensive and Receive-Only Sites

Tests/Loci of Control Levels by Quartile	Mean	N
"Time Out" Test		
First Quartile (lowest)	3.43	295
Second Quartile	6.77	312
Third Quartile	7.64	271
Fourth Quartile (highest)	6.68	310
CMI—Total		
First Quartile	- 1.35	265
Second Quartile	1.78	365
Third Quartile	2.21	312
Fourth Quartile	2.42	354
CMI—Part I		
First Quartile	- 0.71	264
Second Quartile	0.47	366
Third Quartile	0.51	312
Fourth Quartile	0.76	354
CMI—Part II		
First Quartile	- 0.49	261
Second Quartile	0.49	362
Third Quartile	0.84	308
Fourth Quartile	0.76	350
CMI—Part III		
First Quartile	0.01	251
Second Quartile	1.03	350
Third Quartile	0.90	304
Fourth Quartile	1.22	334

The unequal cell N's resulted from missing dependent data, which automatically excluded students from the analyses (i.e., students completed the Locus of Control scale but failed to complete the relevant knowledge test).

Teacher Acceptance. The analysis of variance techniques applied to the knowledge gain scores of students with teachers demonstrating different levels of acceptance revealed five F-ratios ranging from 0.47 to 6.95. A significant F-ratio occurred for the **"Time Out" Test** gain scores. Since unequal N's occurred among the groups, a Bartlett statistic was calculated to test the homogeneity of variance assumption. The resulting Chi-square value of 3.09 was found to be non-significant. Therefore, the F-ratio for the **"Time Out" Test** gain scores can be accepted as indicating significant differences. These data have been presented in Table 94.

TABLE 94
The Degrees of Freedom, Sums of Squares, and F-Ratios for the Knowledge Gain Scores of Students with Teachers Demonstrating Different Levels of Acceptance at Intensive and Receive-Only Sites

Tests	Degrees of Freedom	Sums of Squares	F-Ratios
"Time Out" Test			
Between Groups	3	1,974.21	
Within Groups	793	75,099.88	6.95*
CMI—Total			
Between Groups	3	454.41	
Within Groups	905	55,892.54	2.45
CMI—Part I			
Between Groups	3	68.97	
Within Groups	903	11,939.30	1.74
CMI—Part II			
Between Groups	3	87.75	
Within Groups	892	10,213.64	2.56
CMI—Part III			
Between Groups	3	14.13	
Within Groups	881	88,456.50	0.47

* P less than .05

NOTE: A Bartlett Chi-square value of 3.09 was found to be non-significant at the .05 level.

The indicator of teacher acceptance was obtained by calculating the semester averages of the teachers' weekly ratings of the student series. On the basis of these averages, teachers were grouped into quartiles. The analyses were performed on the knowledge gain scores of their students. An examination of the cell means (Table 95) revealed that the largest average gain (9.32) occurred for those students with teachers demonstrating the highest levels of acceptance (fourth quartile). The second largest gain (6.93) occurred for those students with teachers demonstrating the lowest levels of acceptance (first quartile). The average gains of the students in the second and third quartiles were 5.66 and 5.92, respectively.

TABLE 95

The Cell Means for the Analysis of Variance Performed on the "Time Out" Test Gain Scores of Intensive and Receive-Only Site Students with Teachers Demonstrating Different Levels of Acceptance

Teacher Acceptance Groups	Mean	N
First Quartile (lowest)	6.93	122
Second Quartile	5.66	250
Third Quartile	5.92	181
Fourth Quartile (highest)	9.32	244

The unequal cell N's resulted from differences in class size.

The unequal cell N's resulted from differences in class size.

Student Acceptance. Statistically significant differences were found among the knowledge gain scores of STD students with different levels of acceptance. Analysis of the data revealed five F-ratios ranging from 3.15 to 19.05, all of which were found to be significant. These data have been presented in Table 96.

TABLE 96
The Degrees of Freedom, Sums of Squares, and F-Ratios for the Knowledge Gain Scores of Students with Different Levels of Acceptance at Intensive and Receive-Only Sites

Variables	Degrees of Freedom	Sums of Squares	F-Ratios
"Time Out" Test			
Between Groups	3	5,410.94	
Within Groups	1,019	96,478.42	19.05*
CMI--Total			
Between Groups	3	2,782.51	
Within Groups	1,140	67,088.17	15.76*
CMI—Part I			
Between Groups	3	218.76	
Within Groups	1,138	14,418.96	5.80*
CMI—Part II			
Between Groups	3	107.18	
Within Groups	1,124	12,736.53	3.15*
CMI—Part III			
Between Groups	3	251.14	
Within Groups	1,086	10,708.75	8.49*

* P less than .05

The indicator of student acceptance was obtained by calculating the semester averages of the students' weekly ratings of the student series. Students were then grouped into quartiles on the basis of these averages (first quartile = low, fourth = high).

Since unequal N's occurred among the groups, Bartlett statistics were calculated to test the homogeneity of variance assumption. This analysis revealed five Bartlett Chi-square values ranging from 12.19 to 40.87, all of which were found to be significant. Therefore, the significant differences depicted in Table 96 must be accepted with caution. The data relative to the Bartlett tests have been presented in Table 97.

TABLE 97
The N's, Variances, and Bartlett Chi-square Values for the Knowledge Gain Scores of Intensive and Receive-Only Students with Different Levels of Acceptance

Tests/Acceptance Groups by Quartile	N	Variance	Bartlett Chi-Square Values
"Time Out" Test			
First Quartile (lowest)	263	112.47	
Second Quartile	208	117.90	
Third Quartile	246	58.32	
Fourth Quartile (highest)	306	92.83	26.39*
CMI—Total			
First Quartile	309	53.94	
Second Quartile	250	91.07	
Third Quartile	279	46.04	
Fourth Quartile	306	49.20	40.87*
CMI—Part I			
First Quartile	309	11.16	
Second Quartile	250	16.57	
Third Quartile	279	13.30	
Fourth Quartile	306	10.42	18.07*
CMI—Part II			
First Quartile	304	10.48	
Second Quartile	248	15.57	
Third Quartile	279	10.81	
Fourth Quartile	297	9.16	21.38*
CMI—Part III			
First Quartile	300	10.39	
Second Quartile	217	12.33	
Third Quartile	277	9.21	
Fourth Quartile	296	8.12	12.19*

* P less than .05

NOTE: DF = 3

An examination of the cell means (Table 98) revealed that those students with the highest level of acceptance also had the highest average knowledge gains. The lowest average gains occurred for those students at the next-to-the-lowest acceptance level. On all parts of the **CMI**, the second highest average gains occurred for those students with the lowest level of acceptance.

Unequal cell N's resulted from missing dependent data; i.e., students completed the weekly ratings, but failed to complete the relevant knowledge test.

TABLE 98

The Cell Means for the Analyses of Variance Performed on the Knowledge Gain Scores of Students with Different Levels of Acceptance at Intensive and Receive-Only Sites

Tests/Acceptance Groups by Quartile	N	Mean
"Time Out" Test		
First Quartile (lowest)	263	4.84
Second Quartile	208	3.94
Third Quartile	246	6.15
Fourth Quartile (highest)	306	9.78
CMI—Total		
First Quartile	309	1.84
Second Quartile	250	-0.94
Third Quartile	279	1.36
Fourth Quartile	306	3.53
CMI—Part I		
First Quartile	309	0.62
Second Quartile	250	-0.36
Third Quartile	279	0.34
Fourth Quartile	306	0.85
CMI—Part II		
First Quartile	304	0.57
Second Quartile	248	0.02
Third Quartile	279	0.50
Fourth Quartile	297	0.90
CMI—Part III		
First Quartile	300	0.86
Second Quartile	217	0.31
Third Quartile	277	0.54
Fourth Quartile	296	1.61

ATTITUDE CHANGES

Career-related attitudes were assessed through the administration of the **Attitude Scale** of the **Career Maturity Inventory**. The purposes of this effort were to describe independently the attitude changes of second semester students at all types of sites and to characterize the factors affecting such changes.

Attitude Changes of STD Students (IT and ROT)

During the second semester, the 1,478 STD students demonstrated positive changes in career-related attitudes. On the pre-test, 1,183 (80 percent) of the students correctly answered 60.8 percent of the attitude questions. On the post-test, 85.0 percent of the students correctly answered 65.1 percent of the questions. Overall, a 5.4 percent positive change occurred for those students.

Open Site Students. The 342 students at Open Sites also demonstrated a positive attitude change. However, the pre- and post-difference was not as large as that for the STD students. On the pre-test, 311 (91 percent) of the students correctly answered 62.0 percent of the attitude questions. On the post-test, 66.1 percent of the students correctly answered 66.0 percent of the questions. Overall, these students showed a 3.6 percent positive change.

Comparison Site Students. Relatively small changes occurred in the career-related attitudes of 128 Comparison Site students. On the pre-test, 128 (100 percent) of the students correctly answered 56.9 percent of the questions. On the post-test, 89.1 percent of the students answered 61.0 percent of the questions correctly. Overall, a change of 2.4 percent occurred.

FACTORS RELATED TO ATTITUDE CHANGES

Utilizing analysis of variance techniques, the STD staff investigated those factors related to changes in students' attitudes. The results of these analyses have been described by: (1) type of site; (2) other characteristics; (3) teacher acceptance; and (4) student acceptance.

Type of Site

Analysis of the data on type of site revealed an F-ratio of 7.30, which was found to be significant. Since unequal N's occurred among the groups, a Bartlett statistic was calculated to test the homogeneity of variance assumption. This Chi-square value of 5.32 was found to be non-significant; therefore, the significant F-ratio can be accepted. These data have been presented in Table 99.

TABLE 99

The Degrees of Freedom, Sums of Squares, and F-Ratios for the Attitude Change Scores of Students at Different Types of Sites

	Degrees of Freedom	Sums of Squares	F-Ratio
Between Groups	3	716.91	
Within Groups	1,279	41,871.17	7.30*

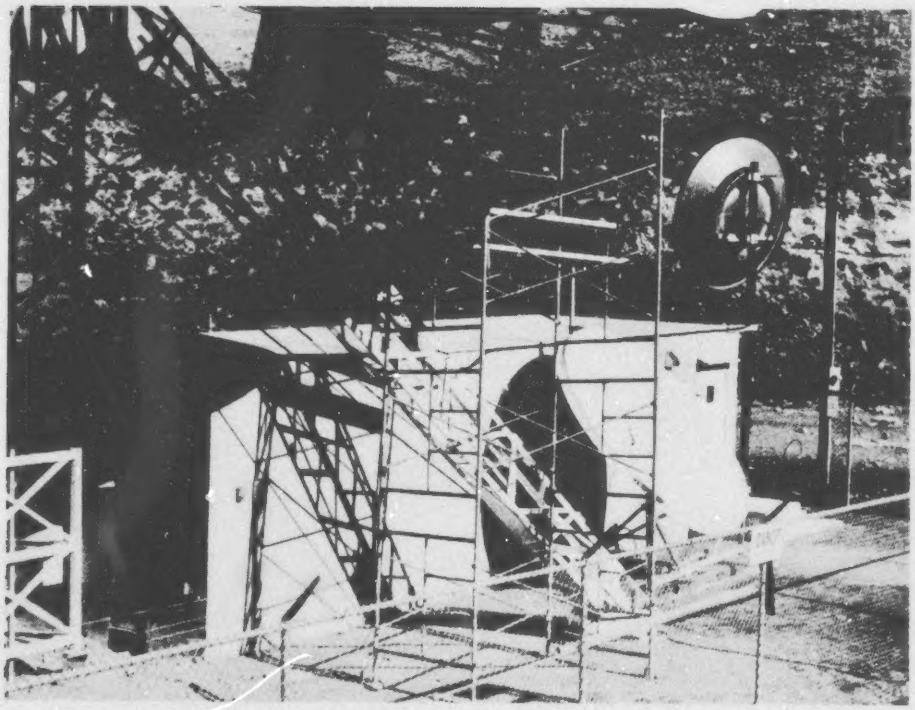
* P less than .05

NOTE: A Bartlett Chi-square value of 5.32 was found to be non-significant.

An examination of cell means (Table 100) revealed that the highest average change of 3.34 occurred for the Intensive Site students. The lowest average change of 0.91 occurred for the Comparison Site students. The average changes of the Receive-Only and Open Site students were 2.38 and 1.54, respectively. Student attitude changes varied concomitantly with the provision of STD products and services.

TABLE 100
The Cell Means for the Analysis of Variance Performed on the Attitude Change Scores of Students at Different Types of Sites

Types of Sites	Mean	N
Intensive	3.34	371
Receive-Only	2.38	599
Open	1.54	208
Comparison	0.91	105



Other Characteristics

Analysis of the data on age, sex, grade, ethnicity, grade-equivalent achievement level, and Locus of Control revealed six F-ratios ranging from 0.00 to 6.42. The F-ratio for Locus of Control was found to be significant. Since unequal N's occurred among the groups, a Bartlett statistic was calculated to test the assumption of homogeneity of variance. The Chi-square value of 37.36 was found to be significant; therefore, the significant F-ratio for Locus of Control must be accepted with caution. These data have been presented in Table 101.

TABLE 101

The Degrees of Freedom, Sums of Squares, and F-Ratios for the CMI Attitude Change Scores of Students with Different Characteristics at Intensive and Receive-Only Sites

Characteristics	Degrees of Freedom	Sums of Squares	F-Ratio
Age			
Between Groups	3	227.40	
Within Groups	1,261	41,854.12	2.28
Sex			
Between Groups	1	.04	
Within Groups	1,266	42,408.83	0.00
Grade			
Between Groups	3	64.37	
Within Groups	1,230	41,569.69	0.64
Ethnicity			
Between Groups	2	18.06	
Within Groups	1,246	41,500.09	0.27
Achievement Level			
Between Groups	6	266.51	
Within Groups	944	30,391.73	1.38
Locus of Control			
Between Groups	3	614.29	
Within Groups	1,278	40,789.46	6.42*

* P less than .05

NOTE: A Bartlett Chi-square value of 37.36 was found to be significant at the .05 level.

An examination of the cell means (Table 102) revealed that the largest attitude change of 3.17 occurred for those students most motivated by something within themselves (fourth quartile). The lowest average change of 1.23 occurred for those students most motivated by their external environment (first quartile). The average changes of those students in the second and third quartiles were 2.68 and 2.38, respectively.

TABLE 102
The Cell Means for the Analysis of Variance Performed on the Attitude Change Scores of Students with Different Loci of Control

Locus of Control Levels by Quartile	N	Mean
First Quartile (lowest)	279	1.23
Second Quartile	358	2.68
Third Quartile	299	2.38
Fourth Quartile (highest)	346	3.17

Teacher Acceptance

A significant difference was not found among the attitude change scores of STD students with teachers demonstrating different levels of acceptance. These data have been presented in Table 103.

The indicator of teacher acceptance was obtained by calculating the semester average of the teachers' weekly ratings of the "Time Out" series. Teachers were then grouped into quartiles on the basis of these averages, with the analysis being performed on the attitude change scores of their students (first quartile = low teacher acceptance; fourth = high teacher acceptance).

TABLE 103
The Degrees of Freedom, Sums of Squares, and F-Ratios for the Attitude Change Scores of Students with Teachers Demonstrating Different Levels of Acceptance at Intensive and Receive-Only Sites

	Degrees of Freedom	Sums of Squares	F-Ratios
Between Groups	3	125.08	
Within Groups	886	28,664.44	1.29*

* P less than .05

Student Acceptance

Analysis of the data on student acceptance levels revealed an F-ratio of 5.22, which was found to be significant. Since unequal N's occurred among the groups, a Bartlett statistic was calculated to test the homogeneity of variance assumption. The resulting Chi-square value of 10.87 was found to be significant; therefore, the significant F-ratio must be accepted with caution. These data have been presented in Table 104.

TABLE 104

The Degrees of Freedom, Sums of Squares, and F-Ratios for the Attitude Change Scores of Students with Different Levels of Acceptance at Intensive and Receive-Only Sites

	Degrees of Freedom	Sums of Squares	F-Ratios
Between Groups	3	524.89	
Within Groups	1,121	37,594.20	5.22*

* P less than .05

NOTE: A Bartlett Chi-square value of 10.87 was found to be significant.

Student acceptance was calculated by obtaining the semester average of the students' weekly ratings of the student series. On the basis of these averages, students were grouped into quartiles (first = low, fourth = high).

An examination of the cell means (Table 105) revealed that the largest average attitude change of 3.31 occurred for those students demonstrating the highest level of acceptance (fourth quartile). The lowest average change of 1.67 occurred for those students demonstrating the next-to-the-lowest level of acceptance (second quartile). The average changes of those students in the first and third quartiles were 1.97 and 3.01, respectively.

TABLE 105

The Cell Means for the Analysis of Variance Performed on the Attitude Change Scores of Students with Different Levels of Acceptance at Intensive and Receive-Only Sites

Acceptance Level Groups	N	Mean
First Quartile (lowest)	291	1.97
Second Quartile	257	1.67
Third Quartile	279	3.01
Fourth Quartile (highest)	298	3.31

Unequal cell N's were due to missing dependent data, which automatically excluded students from the analyses.

CHANGES BETWEEN FIRST AND SECOND SEMESTER

Second semester students demonstrated a higher average gain on all knowledge tests than did first semester students. These differences have been presented in Table 106. A number of factors may have contributed to these differences, including:

(1) changes in second semester programs resulting from first semester formative evaluation;

(2) modifications in the second semester version of the **"Time Out" Test** based on first semester (formative) results;

(3) differences in demographic characteristics between first and second semester student populations; and

(4) differences in levels of teacher acceptance between first and second semester.

TABLE 106
The Average Percentage of Change in the Knowledge Scores of Intensive and Receive-Only Students for the Formative and Summative Semesters and the Differences Occurring Between the Two Semesters

Tests	Formative Semester	Summative Semester	Amount Change
"Time Out" Test	7.0	10.4	+ 3.4
CMI—Total	2.2	3.2	+ 1.0
CMI—Part I	0.9	2.0	+ 1.1
CMI—Part II	1.6	3.0	+ 1.5
CMI—Part III	4.4	5.1	+ 0.7

GENERAL DATA MONITORING AND REPORTING PROCEDURES AND DATA ANALYSIS

The purpose of this section is to provide an overview of the general procedures by which data for all studies were monitored, reported, and analyzed. Specific procedures and techniques have been described in detail with the report(s) for particular studies. Data collection procedures for such unique efforts as the "Case Study" and the "Significant Events Study" have been discussed in the section, "Evaluation Plan."

DATA MONITORING AND REPORTING PROCESS

Based on the operational decision requirements of the STD (its need to solve problems immediately and to allocate or reallocate resources), data monitoring had three purposes: (1) to ensure that field problems were solved as quickly as possible; (2) to support formative evaluation efforts; and (3) to guarantee a reliable data base for summative research studies.

To ensure the effective acquisition of data, the following procedures were applied:

MONITORING

Monitoring consisted of: (1) "check-in" procedures to determine and note the nature, source, and temporal characteristics of the data; and (2) procedures required to assemble and align the data with the computer processing programs.

REPORTING

Reporting consisted of reports (for in-house distribution) on the status of the data and preliminary findings derived from the data.

The **Weekly Site Report** provided critical information for an **"Interim Site Comment Report"** (distributed at least twice a week) which conveyed routine requests for materials and relayed comments indicating technical, programmatic, and/or personnel problems which had occurred at the sites during the previous week. This report included a **"Special Problems"** section which categorized problems (e.g., hardware failures, inaccurate reporting) not identified by field personnel but apparent to regional staff.

Twice a week, **"Site Status Reports"** gave a statistical indication of site acceptance of the Demonstration; this report also described site-specific reactions to programs (e.g., low or no attendance for reasons of disinterest or conflicting activities).

A weekly series of **"Written Comment"** reports included comments and questions from students, teachers, and members of the adult community, taken from letters and the evaluation forms for the J-Series, in-service, and evening programs and provided subjective feedback for ongoing program modifications.

"Attendance Reports" were prepared and distributed (in-house and to the funding agency) twice a month. Figures in this report were based on program attendance reported by site personnel and confirmed by the number of evaluation forms collected from audience members.

DATA ANALYSIS: FORMATIVE PROCEDURES

Because of limited computer staff resources during the formative semester, the STD relied heavily on manual synthesis and analysis of raw data (statistics on data return and attendance) and on anecdotal data (written comments from students, teachers, site personnel, and general audience members) not retrievable by computer.

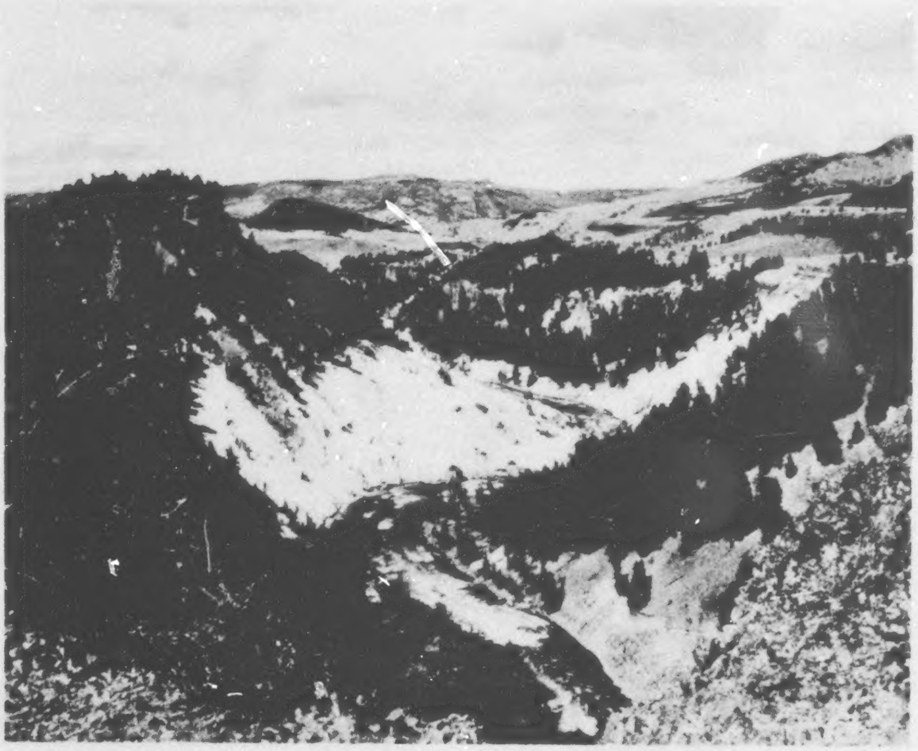
DATA ANALYSIS: SUMMATIVE PROCEDURES

Emphasis was placed on descriptive procedures to provide a data base for future planning and decision-making.

Summarization of frequencies, computations of means, and gain scores were the major analyses performed. Various demographic variables were used as classification criteria (e.g., ethnicity, age, position, length of service, and credit hours). Other descriptors included: level of achievement, pre-broadcast orientation, and perceptions. These classification variables enabled the STD staff to develop a description of the populations served.

Simple first-order correlations were computed to ascertain the relationships between achievement and acceptance and to determine the reliabilities of the data generated by the instruments developed by the STD staff (i.e., the career development **"Time Out" Test** and a semantic differential). The reliability of the nationally standardized **Career Maturity Inventory (CMI)** was established by the test's author prior to its use by the STD. Constraints prevented more sophisticated in-house correlational analyses.

Where appropriate, populations and methodologies used for a specific study have been described fully in the technical documentation section preceding.



COST STUDY

The "Cost Study" involved three activities: (1) the compilation and presentation of aggregate costs by functional area and an allocation of these costs to major phases of activity; (2) adjustments to the aggregate costs for such items as expenses which were irrelevant to the ultimate Project objectives and results, the reallocation of expenses among line items to reflect more accurately functional costs, and the amortization of equipment purchases; and (3) the allocation of functional costs to the following products: career education programs for junior high students, teacher in-service programs, topical adult evening programs, Materials Distribution Service, operational sites, and an operational commications network.

AGGREGATE COSTS

Aggregate Project costs have been presented by :

(1) functional area (i.e., component);

(2) Project phase (Planning, Development, Operation); and

(3) significant line-item category (personnel, subcontracts, capital expenditures, early childhood content development, indirect and other costs).

Total Project expenses were compiled to analyze costs by using an extensive chart of accounts correlated with monthly financial statements. The financial statements reflected expenditures by component function: Administration, Research, Utilization, Broadcast and Engineering, and Program. It was necessary to consolidate early (FY 1972, 1973) financial statements of former functional areas such as Content Development (career education and early childhood which were initially separate entities but were later either eliminated or combined with other components). Another adjustment required to reflect accurate analysis was the Denver Uplink Terminal (DUT) which was purchased with funding from NIE. However, the procurement of and operational responsibility for the DUT was delegated to Broadcast and Engineering, a component funded separately by the Office of the Secretary, DHEW.

The aggregate costs (including adjustments) were allocated to the three Project phases — Planning, Development, and Operation. Although these phases varied in length of time for each functional area (because of divergent activities and schedules), the contractual time periods were: Planning, FY 1971, 1972, 1973; Development, FY 1974; and Operation, FY 1975.

TABLE 107

Expenses by Component:

Component	Expenses
Administration	$ 2,209,233[1]
Research	478,166
Program	4,449,509[2]
Utilization	1,416,389
Broadcast and Engineering	2,776,126
Total Cost	$11,329,423

[1] Administration expenses included $910,125 directly attributable to other components.

[2] Program expense includes $1,691,295 expended on early childhood content development but this component was eliminated from the final Project design.

TABLE 108

Line Item Costs:

Line Item	Cost	Percent of Total Expenses
1. Personnel	$ 4,078,153	36
2. Capital Expenditures	1,416,388	12
3. Early Childhood Development Subcontract	1,691,295	15
4. Subcontracts	1,048,916	9
5. Other Costs	1,659,610	15
6. Indirect Costs	1,435,061[3]	13
Total Cost	$11,329,423	100

[3] Indirect Costs have been computed at the federally approved rate of 25 percent on all costs except capital expenditures and subcontracts.

Included in the line items shown in Table 108 are: (1) costs unrelated to the final STD design (Early Childhood Development Subcontract); (2) costs which should be amortized (equipment, Planning and Development, and program production); and (3) support furnished other HET Experimenters. Absent from this listing is government-furnished equipment used by the STD. Adjustments to reflect these exceptions have been documented in "Financial Statement Adjustments."

FINANCIAL STATEMENT ADJUSTMENTS

The purpose of these adjustments was to reflect Project costs more accurately by: (1) presenting the relative expense of each of the three Project phases (Planning, Development, Operation); and (2) providing data for further analysis to determine the costs of specific STD products and services.

Adjustments were made to the following specific line items and functional areas:

(1) unrelated expenses (i.e., those incurred for efforts not directly related to STD products, e.g., early childhood development content area);

(2) amortization of capital equipment purchases;

(3) Administration expenses chargeable to other components;

(4) expenses incurred by the STD in support of other HET Experiments;

(5) the cost of equipment (ground terminals) and satellite time furnished by the federal government; and

(6) amortization of program production costs and Planning and Development costs.

TABLE 109

Adjustments to STD Total Cost

Component	Column (1) Total Cost	Column (2) Total Cost Excluding Early Child	Column (3) Total Cost w/Amortization Capital Exp.	Column (4) Total Cost w/Allocation Admin. Cost	Column (5) STD Total Cost Excluding Other Experimenters	Column (6) Total Cost w/Addition HEW/NASA	Column (7) Amortized Program Production Costs
Administration	$ 2,209,233	$ 2,209,233	$ 2,083,333	$ 1,361,846	$ 1,361,846	$ 1,361,846	$ 223,375
Broadcast & Engineering	2,776,126	2,776,126	2,092,333	2,272,705	1,837,521	2,165,972	-0-
Program	4,449,509	2,758,214	2,548,170	2,932,439	2,932,439	2,932,439	1,051,927
Utilization	1,416,389	1,416,389	1,416,389	1,494,812	1,494,812	1,494,812	128,816
Research	478,166	478,166	478,166	556,589	556,589	556,589	44,105
Total	$11,329,423	$ 9,638,128	$ 8,618,391	$ 8,618,391	$ 8,183,207	$ 8,511,658	$ 1,448,223

PLUS: Amortization of Planning and Development Costs:	725,047
Operational Costs:	2,219,999
Total Adjusted Project Cost:	$ 4,393,269

The total adjusted expense ($4,393,269) has been shown in column (7) of Table 109. This expense represents an adjustment to the total Project funding ($11,329,423). Adjustments to the component financial statements were made prior to an analysis of the cost of STD products and services and have been summarized in Table 109. The costs which were adjusted (the actual expenditures from STD fiscal year financial statements, grouped into the Project's five functional areas) have been shown in column (1), Table 109.

EARLY CHILDHOOD DEVELOPMENT

The first adjustment was the extraction of expenditures ($1,691,295) of FY 1971, 1972, and 1973 incurred by the early childhood development component. Column (2) in Table 109 reflects this reduction in total Project expenditures ($11,329,423 to $9,638,128).

AMORTIZATION OF CAPITAL EQUIPMENT

A second adjustment shown in column (3) of Table 109 is the amortization of capital equipment which was based upon industry-accepted practice for specific items, discounted at a rate which included: (1) an acceptable "cost of capital" for state and local governments; and (2) the present national inflationary rate. This amortization approach generated costs which included sufficient depreciation allowances (protected against inflation) to purchase new equipment. The adjustment was made to reflect the multi-year life of equipment purchased and to make a more accurate allocation of the cost to be charged against the single operational year of the STD. The categories of equipment purchased, cost, assumed equipment lifetimes, and resultant annual amortized expenses have been given in Table 110.

TABLE 110

Amortization of Capital Expenditures

Equipment	Cost	Life	Annual Amortized Expense
Studio Equipment	$ 286,348	7	$ 76,304
Network Coordination Center	164,047	7	43,714
Denver Uplink Facility	354,353	10	82,177
Ground Terminals - STD	117,041	5	37,210
Ground Terminals - Other HET Experimenters	125,428	5	39,877
IT Terminal - All Experimenters	184,587	5	58,685
Office Equipment	184,584	5	58,684
Totals	$1,416,388		$396,651

The amortized cost was calculated by using an annual cost-of-capital rate of 10 percent plus an annual rate of inflation of 10 percent, giving a total discount rate of 20 percent. This conservative approach was based upon the assumption that the cost of financing (such as bond issue interest rates) would be 10 percent or less and that sufficient funds would be accrued to purchase new equipment by including the additional 10 percent for inflation. Amortization calculations were based on the following formula:

$$AC = PVC \left[\frac{i}{1-(1+i)-n} \right] X\ 12$$

where,

AC = annual amortized cost

PVC = present value of cost (purchase price)

i = monthly interest rate (1.67 or 20 percent annual)

n = equipment life (months)

COMPONENT ALLOCATION OF ADMINISTRATION COSTS

This adjustment (life amortization) yields an annual equipment expense of $396,651 in lieu of the actual purchase cost of $1,416,388. Total adjusted Project expenses ($8,618,391) reflect a reduction of the difference ($1,019,737) as shown in column (3), Table 109.

The third adjustment was the allocation of specific Administration expenses directly chargeable to other components. These expenses had been charged to Administration for accounting convenience. The line items affected were rent and utilities, office equipment leases, insurance, supplies, communication, reproduction, and (amortized costs for) furniture and equipment. The basis on which allocations were made was the percentage of total square feet of office space utilized by each component. The amount allocated from Administration to the other components ($784,225) has been shown in column (4) of Table 109. This reallocation did not affect the total adjusted Project expenditures.

SUPPORT FURNISHED OTHER HET EXPERIMENTERS

The fourth adjustment removed expenses incurred by the STD in support of other HET Experiments. These expenses, although required by the work statement in the federal contract, did not contribute to the development of STD products and were eliminated to reflect a more accurate total STD cost. Independent line-item categories of expense including capital expenditure costs were maintained for the STD's installation and maintenance of ground terminals for the Appalachian Regional Commission (ARC) and the Veterans Administration (VA). The actual costs to be extracted ($283,400) were easily identified.

Other expenses incurred in support of all HET Experimenters were: the Denver Uplink Terminal (DUT), Network Coordination Center (NCC), and the cost of manufacturing the Intensive Terminal (IT) equipment. DUT and NCC costs were allocated to each Experimenter — STD, ARC, VA, and Alaska (includes ALED, IHS, and WAMI) — in proportion to the ATS-6 broadcast hours each used. The allocation of DUT and NCC costs has been shown in Table 113.

The prorated IT manufacturing expense was based on the number of terminals each Experimenter used and the cost per terminal ($3,055). These allocations were applied against the previously adjusted annual amortized expense for the equipment rather than against total purchase cost.

STD management and staff costs allocated to other Experimenters (29 percent) were determined by calculating the STD (Broadcast and Engineering) personnel costs as a percentage of total costs incurred by Broadcast and Engineering and applying this percentage to the subtotal of equipment and installation costs discussed above for support of other Experimenters (29 percent of $337,352 = $97,832; see the summary in Table 111). The total of these adjustments, reflected as a reduction of $435,184 in total STD expenses in column (5) of Table 109, have been summarized in Table 111.

TABLE 111

ARC/Support Costs	$ 258,073
VA Support Costs	25,327
**IT Terminal Prod.-Other Experimenters	22,339
**NCC Amortized Cost-Other Experimenters	20,108
**DUT Amortized Cost-Other Experimenters	11,505
Subtotal	$ 337,352
STD Staff Support Costs (29 percent)	97,832
Total	$ 435,184

**Prorated amounts are annual amortized costs.

GOVERNMENT FURNISHED EQUIPMENT AND SERVICES

A fifth category of adjustments shown in column (6) of Table 109 added the cost of ground terminal equipment and satellite time provided by DHEW and NASA and resulted in the increased expenses shown in Table 112.

TABLE 112

Receive-Only Terminals (60 @ $3,600)*	$ 248,400
VHF Radios (24 @ $980)	23,520
Total Capital Expenditures	$ 271,920
Capital Expenditures Amortized at 20 percent for 5 years	$ 86,451
Satellite Time Used (484 hours @ $500)	242,000
Total Adjustment	$ 328,451

*Vendor delivered price F.O.B., Baltimore, MD.

The estimated cost for satellite time used in the calculations in Table 112 was based on an analysis which indicated that a satellite specifically designed to provide the services required by HET Experimenters would return its capital cost in approximately 36 months at an hourly rate of $500.

TABLE 113

Allocation of NCC and DUT Amortized Cost to Experimenters

1. Allocation of NCC amortized cost of $43,714:

Experimenter	ATS-6 Broadcast Hours	Percent of Broadcast Hrs. Requiring NCC Support	Adjusted Broadcast Hours	Percent of Total Adjusted Hours	Allocation of Cost Based on % of Adj. Hrs.
STD	484	100%	484	54%	$23,606
ARC	30	100%	30	3%	1,311
VA	57	100%	57	6%	2,623
Alaska*	329	100%	329	37%	16,174
Total	900	N/A	900	100%	$43,714

2. Allocation of DUT amortized cost of $82,177:

Experimenter	ATS-6 Broadcast Hours	Percent of Broadcast Hrs. Requiring DUT Support	Adjusted Broadcast Hours	Percent of Total Adjusted Hours	Allocation of Cost Based on % of Adj. Hrs.
STD	484	100%	484	86%	$70,672
ARC	30	20%	6	1%	822
VA	57	100%	57	10%	8,218
Alaska*	329	5%	17	3%	2,465
Total	900	N/A	564	100%	$82,177

*Includes ALED, IHS, and WAMI.

AMORTIZATION OF PROGRAM PRODUCTION AND PLANNING AND DEVELOPMENT COSTS

The sixth category of adjustments shown in column (7) of Table 109 was the amortization of program production costs and Planning and Development costs to arrive at the total adjusted expense of $4,393,269.

PROGRAM PRODUCTION COSTS

The cost of program production ($3,619,426; see Table 116) was determined by identifying that portion of each component's expenditures to support program production, exclusive of all other activities, products, and/or services. Based on an estimate of man-loading for each component's tasks relating strictly to the production of programs, percentage allocations of expenses by fiscal year were obtained. The percent of effort of each component committed to the production of programs was applied against total expenditures, resulting in a total cost of production, including amortized expense of capital expenditures. This total cost of production was then amortized over a three-year period at a discount rate of 10 percent. (The three-year useful life for educational programs produced is the standard used by both PBS and the BBC's Open University.) The cost-of-financing for program production expenses was estimated to be 10 percent. The calculations for the amortization of the total production costs have been shown in Table 114.

TABLE 114

Total Program Cost	$ 3,619,426
Less Previously Amortized Capital Expenditures	(76,304)
Cost to be Amortized	$3,543,122
Amortized Cost—3 years/10 percent	$1,371,919
Plus Amortized Capital Expenditures	76,304
Amortized Program Production Costs	$1,448,223

PLANNING AND DEVELOPMENT COSTS

This adjustment was determined by reducing the adjusted Project total costs by the amount of production and operational costs (Fiscal Year 1975) to arrive at Planning and Development costs of $2,627,234. (See Table 117.) This figure represents the costs for the design and development of the STD operational system (field support network, communications system, evaluation effort, etc.) and, in accordance with standard industry practice for R & D (Research and Development) expenses, was amortized over a five-year period. The amortized expense for Planning and Development costs, utilizing a 10 percent cost-of-capital rate, has been shown in Table 115.

TABLE 115

Total Cost	$ 2,672,234
Less Amortized Capital Expenditures	(58,684)
Cost to be Amortized	$ 2,613,550
Amortized Cost—5 years/10 percent	$ 666,363
Plus Amortized Capital Expenditures	58,684
Amortized Planning & Development Costs	$ 725,047

TABLE 116

Amortized Program Production Costs by Component

COMPONENT	FISCAL YEAR	TOTAL COST	PERCENT OF EFFORT	PROGRAM COST	AMORTIZED PROGRAM COST - 3yrs./10%
Administration*	72	$ 46,314	31%	$ 14,357	
	73	453,676	36%	163,323	
	74	370,583	60%	222,350	
	75	491,273	36%	176,858	
Subtotal		$ 1,361,846	N/A	$ 576,888	$ 223,375
Broadcast & Engineering	72	$ 74,721	-0-	-0-	
	73	327,321	-0-	-0-	
	74	589,329	-0-	-0-	
	75	1,174,601	-0-	-0-	
Subtotal		$2,165,972	N/A	-0-	-0-
Program	72	$ 113,874	60%	$ 68,324	
	73	727,341	60%	436,405	
	74	1,249,532	100%	1,249,532	
	75	841,692	100%	841,692	
Subtotal		$ 2,932,439	N/A	$ 2,595,953	$ 1,051,927**
Utilization	72	$ 82,037	21%	$ 17,228	
	73	505,641	25%	126,410	
	74	429,643	44%	189,043	
	75	477,491	-0-	-0-	
Subtotal		$ 1,494,812	N/A	$ 332,681	$ 128,816
Research	72	$ 4,716	20%	$ 943	
	73	25,908	12%	3,109	
	74	216,830	25%	54,208	
	75	309,135	18%	55,644	
Subtotal		$ 556,589	N/A	$ 113,904	$ 44,105
TOTALS		$ 8,511,658		$ 3,619,426	$ 1,448,223

*Administration's % of effort is ratio of costs incurred by all other components for program production to total costs incurred by all other components.

**Total Program Production Cost	$ 2,595,953
Less Amortized Capital Expenditures	(76,304)
Cost to be Amortized	$ 2,519,649
Amortized Cost	$ 975,623
Plus Amortized Capital Expenditures	76,304
Total Amortized Cost	$ 1,051,927

TABLE 117
Planning & Development Costs

A. Total STD Cost, from Column (6) Table 109	$8,511,658
B. Less Program Production Cost	(3,619,426)
C. Less Operational Costs:	

Fiscal Year 1975 Costs for each component less Program Production costs in FY 1975 included in "B" above.

Administration	$ 491,273	-	$ 176,858	=	$ 314,415	
Broadcast & Engin.	1,174,601	-	-0-	=	1,174,601	
Production	841,692	-	841,692	=	-0-	
Utilization	477,491	-	-0-	=	477,491	
Research	309,135	-	55,644	=	253,491	
	$ 3,294,192	-	$ 1,074,194	=	$ 2,219,998	$ (2,219,998)
Planning & Development Cost						$ 2,672,234

PRODUCT AND OPERATIONAL COSTS

Adjusted functional costs were allocated to the STD products and operational systems through a review of each component's task structure and line-item expenses relative to the effort expended on each product.

Television program costs per hour were determined initially as an aggregate expense for all programs. This value was then allocated to each series on a normalized basis of: (1) the relative number of hours; and (2) amount of time and resources expended for each type of program.

The operational site costs are representative of the expense for all site activities and equipment. This dollar figure will provide marketing guidance for future systems. To provide additional decision-making information, a marginal cost estimate was determined for video production (of additional programs) and for an operational site (including additional site equipment and human support costs).

An analysis of the costs of STD products and services has been presented related to:

(1) per-hour program costs (by program type);

(2) site operations (hardware, human support);

(3) communications network (NCC, DUT, terminals);

(4) marginal (additional) costs of doubling video production; and

(5) marginal (additional) costs for site operations (hardware, human support).

PER HOUR PROGRAM COSTS

The per-hour cost analysis (utilizing the adjusted expenses explained in the previous section) was performed for each of the following programs:

(1) J-Series (for junior high school students);
(2) "Careers and the Classroom: A New Perspective for Teachers" (in-service for school staff);
(3) "Footprints" (for adults);
(4) specials; and
(5) Materials Distribution Service.

The cost per hour of production for each program has been given in Table 118. These costs were obtained by taking the total amortized costs for program production ($1,448,223), prorating it to specific series and dividing the result by the number of hours produced for each program. Program production costs were allocated to the various series by estimating for each component the percent of effort, by fiscal year, committed to the production of the various programs. The percent of effort was then applied to the total production costs contained in Table 116 to arrive at the cost per program. As shown in Table 118, the STD cost per hour for producing the junior high school student programs was $24,456, and the cost per hour for the in-service "Careers and the Classroom" programs was $5,956.

TABLE 118
Amortized Per Hour Cost of Programs

Programs	Amortized Cost	Hours Produced	Cost Per Hour
J-Series	$ 1,145,761	46.85	$ 24,456
"Careers & the Classroom"	117,156	19.67	5,956
"Footprints"	110,510	8.33	13,267
Specials	18,895	13.27	1,424
Materials Distribution	55,901	77.59	721

SITE OPERATIONS COST

The average cost for STD site operations (receive-only and/or two-way audio) has been indicated in Table 119, representing: (1) the cost of required equipment, including installation; (2) the average cost to the STD for providing direct support at the site (salary for the site coordinator, travel expenses for training, etc.); and (3) the cost of the state coordinator who was responsible for coordinating the activities of the seven sites in each state. (The cost of the state coordinator support function was not dependent upon type of site; therefore, the average budget per state for provision of a state coordinator was prorated equally for each of the seven sites: average budget $23,600 ÷7 = $3,371.)

TABLE 119
Site Operations Cost

Expense Category	ROT Site Operations Cost	Two-Way Audio Site
Equipment	$ 4,600	$ 8,635
Site Support	1,007	1,612
State Coordinator	3,371	3,371
Total Cost	$8,978	$13,618

COMMUNICATIONS NETWORK COST

The cost of hardware for the STD communications system has been given in Table 120.

TABLE 120
STD Communications System Hardware Costs

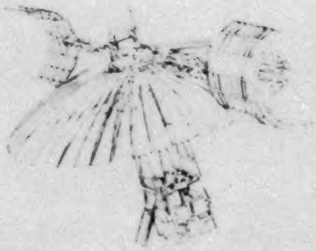
Expense Category	Purchase Cost
Receive-Only Terminals, 44 @ $4,600	$ 202,400
Two-Way Audio Termials, 24 @ $8,635	207,240
Denver Uplink Terminal	354,353
Network Coordination Center	164,047
Total Purchase Cost	$ 928,040

MARGINAL COSTS FOR SITE OPERATIONS

Marginal costs associated with adding Receive-Only Terminals to increase the STD audience would have been the same as those per-site operational costs presented in Table 119. Assuming that for each set of seven Receive-Only Terminals added to a state, a (state coordinator) position would be added to coordinate the activities of these sites (as was the case in Table 119, in which the STD's state coordinator was responsible for seven sites), then the marginal cost per operational Receive-Only Terminal would be $8,978 (from Table 119). The foregoing assumes quantity purchase of no fewer than 100 terminals.

TABLE 121
Marginal Costs of Doubling Program Production

Category	Cost
Personnel—Studio Crew	$ 92,475
Personnel—Content Development	137,618
Personnel—Graphic/Print Materials	28,350
Personnel—Actors	51,925
Tape Stock	31,700
Utilities	7,200
Equipment Maintenance	20,000
Graphics Supplies	10,000
Indirect Cost—25 percent	94,817
Total Marginal Cost	$ 474,085



THE FUTURE

"THE FUTURE IS NOT A GIFT: IT IS AN ACHIEVEMENT."

Robert F. Kennedy

A NATIONAL PRIORITY: A PUBLIC SERVICE SATELLITE NETWORK

From the experience gained in three years of planning and development and one year of operation of the Satellite Technology Demonstration, an urgent recommendation emerges:

> *That the Congress of the United States legislate a national agency to establish policy for the immediate use of a satellite-based public service communications system and fund the construction of a network dedicated solely to the use of health, education, and social services.*

There are compelling reasons for making this recommendation: the need to address human problems which can be solved by satellite communications; the existence of a group of users which not only accepts the technology but demands its availability; and the lack of any single national, regional, state, or local organization — except the federal government — with sufficient resources to construct a public service satellite network. If the federal government does not accept the responsibility and maintain its leadership in space communications, the social benefits and economic potential of a satellite communication system will not be realized.

A NEED FOR URGENCY

Few broadcast channels remain which can be used for a public service satellite system, and requests for the allocation of frequencies exceed the capacity of the communication spectrum. The competition for channel assignments between educational and commercial interests involves the same test of national priorities which came before the Federal Communications Commission in 1952 when it reallocated the transmission frequencies for the new medium of television and made the nationwide channel assignments under which television operates today.

The issue then, and now, that some channels be reserved for the future use of education, should be a major agenda item of the plenary session of the World Administrative Radio Conference.

There was great pressure then from private enterprise to allocate all of the VHF channels for commercial operation. Education, it was argued, did not need the channels and would "waste" the valuable frequencies because there were few applications for non-commercial licenses, and no educational stations were prepared to begin immediate operation. The Commission made a farsighted decision. It determined that it would take time for the educational service to be developed, but that "the need for non-commercial educational stations had been amply demonstrated." The Commission, under much criticism from private enterprise, set aside more than 100 channels for educational use.

Two decades later, the foresight of this decision has been vindicated. Had it not been made, educational television would have had no place in the VHF band which it now uses for public broadcasting. History is repeating itself. If there is to be public service satellite telecommunications in the future, it is vital that national priorities be set and frequency allocations be made now. The time is here to secure the United States' substantial investment in space exploration and ensure a continuing return to its investors.

DEPENDENCE ON PRIVATE ENTERPRISE

Experience has led us to conclude that public service needs will most probably be ignored altogether if the future development of satellite communications is left *solely* to private enterprise. Public service has never taken priority over the profit-making potential of commercial communications traffic.

There is an analogy to be drawn between public service satellite communications today and public television 20 years ago, before national leadership and a national policy created the Corporation for Public Broadcasting. The federal government was the catalyst for public television's growth and development, leading to the establishment of the nationwide Public Broadcasting Service. Left to private enterprise or to the initiative of individual schools and colleges, public television would not have become a national asset. Will the same be true of satellite communication?

A PIONEER WITHDRAWS

Currently, the United States, the nation which pioneered and developed space communications at great public cost, is not committed as a government to the continuation of a public satellite service. The agencies of our federal government have abdicated this responsibility.

An increasing number of countries, many of them influenced by the success of the STD, are building national satellite networks because they believe this new technology will help them alleviate starvation, ignorance, illness, and the alienation of their people. It has been predicted that, within a decade, 20 developing countries will have operational public service satellite systems and that a worldwide space communications network will be a reality.

THE ATS-6/HET EXPERIMENTS

Until the recent completion of the Health, Education, Telecommunications (HET) Experiments, which included the STD, there had been no application of a practical, satellite-based communications system for the delivery of social services for the solution of urgent human problems. In one year of operation, the STD established and demonstrated the utility of public service space communications with rural, isolated audiences. The service was accepted. There is now a growing demand for its continuation from the user public.

The STD demonstrated that, for satellite technology, distance and terrain are no longer barriers to reaching 50 million rural citizens in the United States, many of whom are without adequate health care and educational opportunities.

DEFICIENCIES IN RURAL HEALTH CARE AND EDUCATION

Because regional social problems and needs are persistent, deficiencies in health care and education for rural citizens will not be remedied by short-term efforts. Their problems will be solved only through a structured, dedicated, permanent service.

Educational opportunity for students in rural schools is not as great as it is in well-financed urban and suburban schools. For out-of-school rural citizens, diverse ethnic cultures, migrants, the aged, and institutionalized populations, the urban advantages of continuing education are nonexistent in thousands of communities. Special education for the handicapped, who comprise 10 percent of our in-school population, is too labor-intensive and costly for most rural school districts.

Despite the billions of taxpayer dollars invested annually in support of the national educational system, it is being criticized at all levels and demand for "accountability" is heard frequently. Inadequate and unequal educational opportunity are reflected in the terms "drop-out" and "functional illiterate" which describe more and more U.S. citizens. A satellite communications delivery system is a viable option to remedy educational deficiency for all citizens and possibly the only effective means of delivering health and education services to remote and isolated populations.

NATIONAL RESOURCES AND COMMUNITY HARDSHIP

A nationwide reassessment of natural resources and the national "crash" programs to reduce energy shortages are creating hardship for rural communities near existing resources. Booming populations are overburdening inadequate municipal services and overloading health care and education in scores of towns and villages in the Rocky Mountain West. While it is vital to national survival that the energy-rich West share its resources, it is critical that the process avoid the social problems which accompany rapid energy development.

Multi-state planning shared by a satellite communication system can aid in the intelligent development of national assets and conservation of the environment. Satellite-delivered education and health care may be the most immediate and efficient way to assist overworked teachers and doctors in isolated communities near the country's needed resources.

AN INTERACTIVE COMMUNICATIONS SYSTEM

The HET Experiments in 23 states over the past year encouraged and promoted user participation. The satellite network was a two-way communications system. Many participants in satellite communities could share information — and understanding — with all of the others. The HET Experiments and the STD suggest the rewards to be gained from a communications system which encourages citizens to talk to one another. The world of a student in Monte Vista in the San Luis Valley of Colorado no longer ended with the Sangre de Cristo Mountains. The satellite brought him the voice of a friend a thousand miles away in Fort Benton on the banks of the Missouri River in Montana. The reestablishment of understanding and a national unity of purpose are potential benefits of satellite communication.

A PUBLIC SERVICE SATELLITE NETWORK: A USER-RESPONSIVE, USER-SUPPORTED SYSTEM

It is recommended that the proposed national satellite network adopt, from its genesis, a user-responsive policy. To a great degree, the acceptance and use of the STD, its services, and its products can be attributed to the involvement of users in every step of its planning, development, and operation.

Furthermore, the network should become a permanent and continuing service to the people of the United States, supported and sustained by the people who use it. There is evidence coming out of the HET Experiments that the human resources and the health and education programs are available for use with a public service satellite. The users have the financial support to program and operate a satellite system. However, they lack the investment capital to construct a public service satellite network. The resources to use a satellite system are supported by the dedication and conviction that, through the cooperative utilization of a public service satellite system, national problems in health and education are solvable.

THE SATELLITE SYSTEM

Although the technical design of the national satellite network cannot be defined precisely without additional investigation, the system should have some obvious capabilities to meet the needs described in this recommendation. The network should have two-way communication and multi-channels for a number of simultaneous users and programs; it should be available for access on a continuous, around-the-clock basis, and be a service open to any group of users whether or not they have program production ability or capability. It should interface with existing terrestrial communications systems, both private and those dedicated to public service including state and regional communications, public broadcasting, and community and cable television. Today's reality requires that network design be compatible with satellite systems being constructed by other nations and planned with the vision to foresee the future when public service satellite networks encircle the earth.

SATELLITE INFORMATION AND RESEARCH

The application of satellite services and the evolution of satellite technology are concurrent and complementary processes. Technological development comes, frequently, because there is a need or a use which cannot be met by existing technology. Technical discovery often suggests its own applications. Space and social scientists need a common meeting ground for the exchange of problems and information if the results of discoveries and their applications are to be realized.

The response to inquiries by the Public Service Satellite Consortium indicates an increasing interest in satellite communications and a need for knowledge about it, how it works , and how to use it. Nowhere is there an information exchange to satisfy these needs for applied knowledge. As a nation we have the resources We have not brought them together.

Therefore, a national public service satellite network should, in addition to its other functions, compile and disseminate information about satellite communications, coordinate its applications, and search for new ways to apply space technology to human needs. We have come to a standstill on the edge of new discoveries and applications for space communications. We must take the next steps now. The future is here.

COLORADO
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The following Technical Reports can be obtained from the National Institute of Education:

Number	Title
TR0127	Project Organization and Management — Analysis of a Model
TR0132	Public Information: The Plan, Its Execution, The Results
TR0209	The Process of Planning and Designing Research for an Educational Telecommunications Effort
TR0210	The Formative Process Used by the Satellite Technology Demonstration in the Development of Television Programming for Junior High School Students
TR0211	Determining User Needs as a Basis for the Educational Programming of Large-Scale Projects
TR0213	The Contribution of an Internal Review Panel to the Development of Educational Programming
TR0217	The Use of a Satellite Human Interaction System in Conjunction with a Satellite Media Distribution System
TR0333	The Development of a Field Services Network for a Satellite-Based Educational Telecommunications Experiment
TR0334	Field Operations and Federal and Regional Policy Changes
TR0335	STD Experiences with Varied Terrestrial Signal Distribution Methods
TR0337	Technological Innovation and Educational Practice: A Discussion of the Future
TR0417	The Voice/Data Communications System in the Health, Education Technology Experiment
TR0418	STD Uplink Complex
TR0419	The STD Site Operator
TR0421	STD Installation and Maintenance Procedures
TR0422	Network Performance and Coordination in the HET Communications System
TR0423	Ground Terminals in the HET Network
TR0426	The Limited Digital Response System in the STD Experiment
TR0501	Materials Distribution
TR0502	Integrating Existing Material into Educational Television Programming
TR0503	Programming as an Instrument for Community Involvement: Designing Topical Television Programs for Rural Adult Audiences

TR0504	Production Organization and Development Process
TR0505	The Use of Courseware Teams for Achieving Content Objectives in Television Production
TR0506	Developing and Implementing a Content Structure for Educational Television Programming in the Area of Career Education
TR0508	Developing Printed Supplementary Materials to Accompany Satellite Programming for Junior High School Students
TR0509	Program Vehicles for Junior High School Audiences.

Case Studies on three STD sites can be obtained from the National Institute of Education.

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This report was produced with funding from the National Institute of Education Contract No. NIE-C-74-0150. The views expressed do not necessarily reflect those of the National Institute of Education or the U.S. Department of Health, Education, and Welfare.